Problem Set 1

1) The economy of the university town of Avicenna (if you wish, cf.: Peter Beagle (1986): The Folk of the Air http://amzn.to/1RxRFQJ (New York: Del Rey: 0345337824)) produces two and only two commodities: yoga lessons, and lattes. The ten workers in the economy are able to produce the following amounts of lattes and teach the following amounts of yoga lessons each day:

Worker	Yoga Lessons	Lattes
Alfred	50	500
Beatrice	100	500
Cixi	150	500
Dante	200	500
Earendil	250	500
Faramir	300	500
Gaius	350	500
Hrothgar	400	500
Indira	450	500
Jenghiz	500	500

a) On a graph, draw the Production Possibility Frontier of Avicenna

Begin with everybody teaching yoga lessons and nobody making lattes—at the point (2750, 0) on the graph (if you have chosen yoga for your x- and lattes for your y-axis). Now suppose the economy wants to produce lattes. Any of the ten people could produce 500 lattes. But in order to produce those lattes, you have to move them to the café and off of the mat and so sacrifice having some yoga lessons taught. What is the best thing to do? Well, looking at the table you see that Alfred (an Old English name meaning "wisdom of the elves". The most prominent historical figure was King of the English realm of Wessex—shortened "Westseaxna Rice", "Realm of the West-Saxons" or "western realm of the knife-guys" —from 871-899; he is the reason that we today think of England as more Germanic than Norse) has a comparative advantage at making lattes of 10:1: he can make 10 lattes for the time and resources he needs to teach one yoga lesson. Pull Alfred off the mat and put him to work at

the milk frothing machine and you only sacrifice 50 yoga lessons—fewer than anybody else.

So we pull Alfred off of the yoga mat and put him to work at the milk frother, have him produce 500 lattes, and draw the next point (2700, 500) on the PPF.

What if we don't want 500 but only 250 lattes? Well, if Alfred spends half his time at the café and half his time on the mat, he can make 250 lattes and teach 25 yoga lessons—and similarly for some other combination of shifts. Therefore draw a straight line between (2750, 0) and (2700, 500) for that part of the PPF.

Now suppose we are at (2700, 500) and want to produce more lattes—1000, say? who is the next person we should pull off of the yoga mat and put to work at the milk frother in order to have the most efficient economy? Who has the second greatest comparative advantage in making lattes? Well, from the table it's Beatrice (Latin: "she who blesses" or "she who brings joy". The most prominent figure in literature is the Beatrice is Dante's patron and guide through the Afterlife in his *Divine Comedy*), with a 5:1 comparative advantage. She should shift next. So put Alfred and Beatrice to work in the café, and draw in the (2600, 1000) point on the PPF.

By a similar argument as with Alfred, Beatrice could produce 250 lattes and teach 50 yoga lessons if she split her shifts. So connect (2600, 1000) to (2700, 500) for the next segment of the PPF.

Note that along the straight-line segments of the PPF, the slope of the PPF is equal to the comparative advantage of the person who is, as you move along that straight line, switching from teaching on the mat to working the milk frothing machine.

Continuing to work down the table, note that I have already arranged the potential workers not just in alphabetical order but from most to least in their comparative advantage at making lattes. So, in order, move successively Cixi (Mandarin "Empress of the Western Palace". The historical figure known as Cixi was born Yehenara, "Little Orchid", and was Regent of Qing China from 1861-1908. At the end of her reign, China was one of the only ten or so Asian and African realms that had not been colonized by European powers), Dante, Earendil, Faramir, Gaius, Hrothgar, Indira, and Jenghiz off of the yoga mat and into the café. And draw in the points (2450, 1500), (2250, 2000), (2000,

2500), (1700, 3000), (1350, 3500), (950, 4000), (500, 4500), and (0, 5000)—the last corresponding to the situation in which all ten are working at the café and nobody is teaching yoga.

Connect those points with straight lines to complete the PPF.

And you are done.

Note that if we had simply moved away from producing 2750 lessons and zero lattes by having everybody work half-time at the café and half-time at the gym, we would be producing 1375 lessons and 2500 lattes—well inside the PPF. We could produce 1800 lessons and 3000 lattes if we just had Gaius, Hrothgar, Indira, and Jenghiz teaching yoga. Specializing in your comparative advantage in production is a very good thing to do!

b) On a graph, draw the supply curve for lattes if the price of yoga lessons is $10/ lesson.

You can start either from the table, or from the PPF…

From the PPF: We know that the price of yoga is $10/lesson. Suppose that the price of lattes were $0/latte. What would the value of production be? Well, the value of production would then be simply ten times the number of lessons taught. So start at the (2750, 0) point, calculate that (2750 yoga lessons) x ($10/ lesson) = $27,500 worth of yoga taught, and draw a straight line upward from

(2750, 0). That straight line tells you the combinations of yoga lessons and lattes that are worth $27,500 at a yoga price of $10/lesson and a latte price of $0/latte. Points to the right and above this line are worth more; points below and to the left of this line are worth less.

Is there any point on the PPF to the right of this line? No. That tells us that combinations of yoga lessons and lattes that produce more than $27500 of value at these prices are unattainable: they are outside the economy's PPF.

Is there any point on this line other than (2750, 0)? No. That tells us that (2750, 0)—with all ten potential workers on the mat in the gym teaching yoga, and nobody working at the café—is the only attainable combination at which $27,500 of value is created, and is the most profitable way for workers to arrange their shifts. And that tells us that the supply of lattes is 0 when the price of lattes is 0.

From the table: At a price of $10/lesson for yoga and $0/latte for lattes, would any of the ten potential workers make more money working at the café than teaching yoga in the gym? No. All ten will therefore choose to work in the gym, none will choose to work in the café, and so the supply of lattes is zero when the price of lattes is $0/latte.

Draw the (0, $0) point on the supply curve, with the quantity of lattes produced on the x-axis and the price of lattes on the y-axis.

Now let's gradually raise the price of lattes from $0/latte to just a hair under $1/latte. What happens?

On the PPF: As the price of lattes rises from $0/latte toward $1/latte, the line that tells us combinations of yoga lessons and lattes that are worth $27,500 rotates counterclockwise around the point (2750,0). At a price of $0/latte that line passed through (2750, 0) and (2750, 500). At a price of $0.50/latte that rotating line passed through (2750, 0) and (2700, 1000). At a price of $0.99/ latte that rotating line passes through (2700, 505.0505…).

Is there any point on the PPF to the right of and above the rotating line? No. That tells us that combinations of yoga lessons and lattes that produce more than $27500 of value at these prices are unattainable: they are outside the economy's PPF.

Is there any point on this line other than (2750, 0)? No. That tells us that (2750, 0)—with all ten potential workers on the mat in the gym teaching yoga, and nobody working at the café—is the only attainable combination at which $27,500 of value is created, and is the most profitable way for workers to arrange their shifts. And that tells us that the supply of lattes is 0 when the price of lattes is anything from $0/latte but less than $1/latte.

From the table: At a price of $10/lesson for yoga and more than $0/latte but less than $1/latte for lattes, would any of the ten potential workers make more money working at the café than teaching yoga in the gym? No. All ten will therefore choose to work in the gym, none will choose to work in the café, and so the supply of lattes is zero when the price of lattes is anything from $0 to just less than $1/latte.

Draw the line from (0, $0) up to a hair less than (0, $1) on the supply curve, with the quantity of lattes produced on the x-axis and the price of lattes on the y-axis.

Now let's raise the price of lattes from a hair under to exactly $1/latte. What happens?

On the PPF, when the price of yoga is $10/lesson and the price of lattes is $1/latte, the rotating line corresponding to $27,500 of value produced now intersects the PPF along its whole length from (2750, 0) to (2700, 500): producing at any of those combinations—and they are all attainable—generates $27,500 of value.

From the table: all of the potential producers except Alfred still make more money teaching yoga than pulling lattes. They remain at work in the gym rather than at the café. Alfred, however, can make $500 teaching yoga at a price of $10/lesson, can make $500 pulling lattes at a price of $1/latte, or split his shifts and produce any linear combination of 50 yoga lessons and 500 lattes and make $500. Alfred is *indifferent*. He will produce up to 500 lattes at a price of $1/latte depending on what demand at $1/latte is, and spend the rest of his time happily teaching yoga.

Draw a straight line on the supply curve from (0, $1) to (500, $1), to show that at a price of $1/latte the quantity of lattes supplied can and will be anything between 0 and 500, depending on what the demand for lattes is.

Now let's gradually raise the price of lattes from $1/latte to just a hair under $2/latte. What happens?

From the PPF: As the price of lattes rises from $1/latte toward $2/latte, the line that tells us combinations of yoga lessons and lattes that are worth as much as is produced at the (2700 lessons, 500 lattes) combination rotates counterclockwise around the point (2700, 500). At a price of $1/latte, that line passed through (2700, 500) and (2650, 1000). At a price of $1.50/latte, that line passed through (2700, 500) and (2625, 1000). At a price of $1.99/latte, that line passes through (2700, 500) and (2600.5 , 1000).

Is there any point on the PPF to the right of and above the rotating line? No. That tells us that combinations of yoga lessons and lattes that produce more value than (2700 lessons, 500 lattes) at these prices are unattainable: they are outside the economy's PPF.

Is there any point on this line other than (2700 lessons, 500 lattes)? No. That tells us that (2700 lessons, 500 lattes)—with Alfred working at the café, and all other nine potential workers on the mat in the gym teaching yoga—is the only attainable combination at which the most of value is created, and is the most profitable way for workers to arrange their shifts. And that tells us that the supply of lattes is 500 when the price of lattes is anything from $1/latte up to less than $2/latte.

From the table: At a price of $10/lesson for yoga and more than $1/latte but less than $2/latte for lattes, would any of the ten potential workers besides Alfred make more money working at the café than teaching yoga in the gym? No. All workers except Alfred will therefore choose to work in the gym, only Alfred will choose to work in the café, and so the supply of lattes is 500 when the price of lattes is anything from $1 to just less than $2/latte.

Draw a straight line from (500, $1) up but not quite to (500, $2) to show that the quantity supplied of lattes is 500 when the price is less than $2/latte but is $1/latte or greater.

Now let's raise the price of lattes from a hair under to exactly $2/latte. What happens?

On the PPF, when the price of yoga is $10/lesson and the price of lattes is $2/latte, the rotating line corresponding to maximum value produced now

intersects the PPF along its whole length from (2700, 500) to (2600, 1000): producing at any of those combinations—and they are all attainable—generates the maximum value.

From the table: all of the potential producers except Alfred and Beatrice still make more money teaching yoga than pulling lattes. They remain at work in the gym rather than at the café. Alfred, however, makes more at the café. And Beatrice can make $1000 pulling lattes at a price of $2/latte, or split her shifts and produce any linear combination of 100 yoga lessons and 500 lattes and make $1000. Beatrice is *indifferent*. She will produce up to 500 lattes at a price of $2/latte depending on what demand at $2/latte is, and spend the rest of her time happily teaching yoga. And Alfred will produce 500 lattes.

Draw a straight line on the supply curve from (500, $2) to (100, $2), to show that at a price of $2/latte the quantity of lattes supplied can and will be anything between 500 and 1000, depending on what the demand for lattes is.

Continue walking down the table and rotating the maximum-value line on the PPF. Find out that at $3/latte Cixi, $4 Dante, $5 Earendil, $6 Faramir, $7 Gaius, $8 Hrothgar, $9 Indira, and $10 Jenghiz are willing to move over to the café. Jump up the quantity of lattes supplied by 500, therefore, when the price hits $3, $4, $5, $6, $7, $8, $9, and $10. And you are done:

c) If the market price of yoga lessons is $10/lesson and the price of lattes is $5.10/latte: Who produces lattes? Who teaches yoga? How many lattes are produced? How many yoga lessons are taught?

From the table: At a price of lattes of $5.10/latte, Alfred, Beatrice, Cixi, Dante, and Earendil make more money at the milk frother than on the yoga mat. Thus we have 2500 lattes. The other five make more money teaching yoga. Thus we have 2000 yoga lessons.

From the PPF: At $5.10/latte and $10/lesson the maximum revenue line passes through (2000 lessons, 2500 lattes) and yields $32,750 of revenue. It nowhere else intersects the PPF. At that price vector, therefore, we have 2500 lattes and 2000 yoga lessons. (For who, exactly, you need to resort to the table).

From the supply curve: at $5.10/latte, the quantity of lattes supplied is 2500. You need to go to the PPF (or the table) to figure out how many yoga lessons are taught. You need to go to the table to figure out who does what.

d) If the market price of yoga lessons is $10/lesson and the price of lattes is $0.50/latte: : Who produces lattes? Who teaches yoga? How many lattes are produced? How many yoga lessons are taught?

We have 2750 yoga lessons and no lattes. Everyone teaches yoga.

From the table: At a price of lattes of $0.50/latte, everyone makes more money on the yoga mat. Thus we have 0 lattes, and 2750 yoga lessons.

From the PPF: At $0.50/latte and $10/lesson the maximum revenue line passes through (2750 lessons,0 lattes) and yields $27500 of revenue. It nowhere else intersects the PPF. At that price vector, therefore, we have 2750 yoga lessons, with everyone teaching yoga.

From the supply curve: at $0.50/latte, the quantity of lattes supplied is 0. You need to go to the PPF (or the table) to figure out how many yoga lessons are taught. Everybody is teaching yoga, since nobody is making lattes.

e) If the market price of yoga lessons is $10/lesson and the price of lattes is $8.05/latte: Who produces lattes? Who teaches yoga? How many lattes are produced? How many yoga lessons are taught?

We have 4000 lattes and 950 yoga lessons. Indira and Jenghiz teach yoga—everyone else make lattes.

From the table: At a price of lattes of $8.05/latte, Alfred, Beatrice, Cixi, Dante, Earendil, Faramir, Gaius, and Hrothgar make more money at the milk frother than on the yoga mat. Thus we have 4000 lattes. Indira and Jenghiz more money teaching yoga. Thus we have 950 yoga lessons.

From the PPF: At $8.05/latte and $10/lesson the maximum revenue line passes through (950 lessons, 4000 lattes). It nowhere else intersects the PPF. At that price vector, therefore, we have 4000 lattes and 950 yoga lessons. (For who, exactly, you need to resort to the table).

From the supply curve: at $8.05/latte, the quantity of lattes supplied is 4000. You need to go to the PPF (or the table) to figure out how many yoga lessons are taught. You need to go to the table to figure out who does what.

f) If the market price of yoga lessons is $20/lesson and the price of lattes is $8.05/latte: : Who produces lattes? Who teaches yoga? How many lattes are produced? How many yoga lessons are taught?

Things have just become more interesting. The price of a yoga lesson has just doubled. Is this because everyone has, all of a sudden, become only half as good at teaching yoga? Probably not. It's just inflation. The right way to think about this is that the opportunity costs are the same as if the price of yoga was $10 and the price of lattes is $4.025, and we drew our supply curve for a $10 price of yoga. So look at the P = $4.05 spot on the supply curve: see 2000 lattes.

From the table: At a price of lattes of $8.05/latte *and a price of yoga lessons of not $10 but $20/lesson*, Alfred, Beatrice, Cixi, and Dante *and those four alone* make more money at the milk frother than on the yoga mat. Thus we have 2000 lattes. Earendil, Faramir, Gaius, Hrothgar, Indira and Jenghiz more money teaching yoga. Thus we have 2250 yoga lessons.

From the PPF: At $8.05/latte and $20/lesson the maximum revenue line passes through (2250 lessons, 2000 lattes). It nowhere else intersects the PPF. At that price vector, therefore, we have 2000 lattes and 2250 yoga lessons. (For who, exactly, you need to resort to the table).

g) If the market price of yoga lessons is $40/lesson and the price of lattes is $6/latte: : Who produces lattes? Who teaches yoga? How many lattes are produced? How many yoga lessons are taught?

Now the opportunity costs are all as if the price of yoga was $10 and the price of lattes $1.50.

From the supply curve: look at the P=$1.50 spot for the supply curve drawn with a $10 yoga lesson price, and see that 500 lattes are produced (for yoga lessons you need to consult the PPF or the table; for who does what you need to consult the table).

From the table: At a price of lattes of $6/latte *and a price of yoga lessons of not $10 but $40/lesson*, only Alfred makes more money at the milk frother than on the yoga mat. Thus we have 500 lattes. The rest make more money teaching yoga. Thus we have 2700 yoga lessons.

From the PPF: At $6/latte and $40/lesson, the maximum revenue line passes through (2700 lessons, 500 lattes). It nowhere else intersects the PPF. At that price vector, therefore, we have 500 lattes and 2750 yoga lessons. (For who, exactly, you need to resort to the table).

2) The economy of the university town of Avicenna (if you wish, cf.: Peter Beagle (1986): The Folk of the Air http://amzn.to/1RxRFQJ (New York: Del Rey: 0345337824)) produces two and only two commodities: yoga lessons, and lattes. When the price of yoga lessons is $10/lesson, the supply curve for lattes is:

SUPPLY: $P = 0 + Q_s/500$ up to a maximum quantity produced of 5000 lattes

a) On a graph, draw the supply curve for lattes if the price of yoga is $20/lesson. Also draw the supply curve for lattes if the price of yoga is $40/lesson.

Remember: behind your supply curve there is, lurking somewhere, a Production-Possibility Frontier and a table telling you what the resources and capabilities of the potential workers in the economy are. Workers are trying to choose what is best for themselves—and it is their behavior in response to the different incentives provided them by market prices that determines and is summarized in the supply curve.

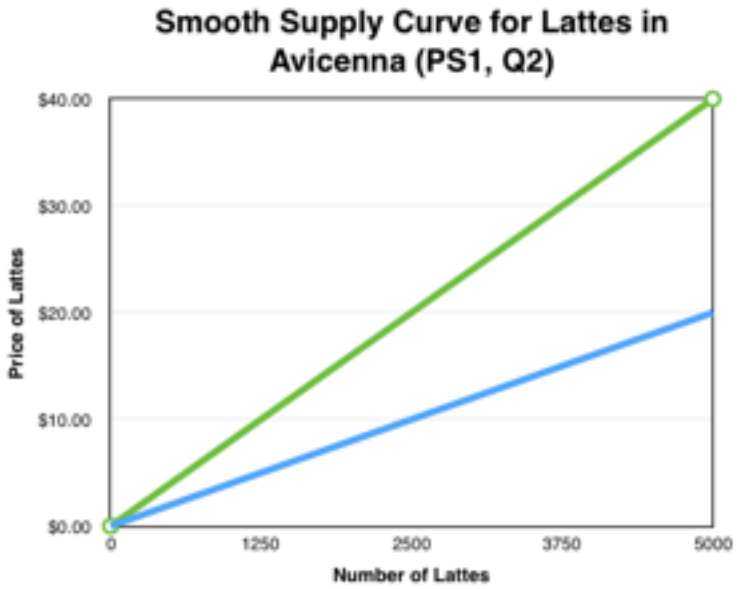
At a value of yoga lessons of $20/lesson, the opportunity cost, measured in dollars, of producing lattes is twice as great as in the baseline case, where the price of yoga was $10/lesson and the supply curve was $P = 0 + Q_s/500$. Workers will therefore demand twice as much in order to induce them to make lattes. The supply is thus:

$P = 0 + Q_s/250$ when the price of yoga is $20/lesson.

Similarly, at a value of yoga lessons of $40/lesson, the opportunity cost, measured in dollars, of producing lattes is twice as great as in the baseline case, where the price of yoga was $10/lesson and the supply curve was $P = 0 + Q_s/500$. Workers will therefore demand twice as much in order to induce them to make lattes. The supply is thus:

$P = 0 + Q_s/125$ when the price of yoga is $40/lesson.

So we have:



b) What do you think the Production Possibility Frontier of Avicenna is? Draw what you think is the PPF. Explain why you think this is the PPF.

This question was a disaster—and the reason why we are curving the grades on this problem set up.

What I had hoped that you would do was think: "In 1 we built a PPF and a supply curve out of a table. Now we have a supply curve. Surely we can reverse-engineer the table and the PPF lurking behind the supply curve."

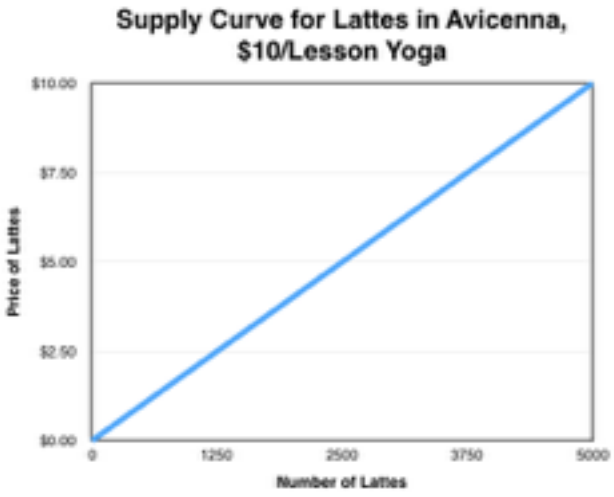
The next step would be to have noticed that the supply curve for a $10/lesson yoga price of

$P = 0 + Q_s/500$

starts at (0, $0) and ends at (5000, $10) and looks a lot like the supply curve built in 1b)—except that it is smooth and upward-sloping rather than stair-stepped. And the step after that would have been to say: if the supply curve is very similar, the underlying table should be very similar, and the PPF should be very similar—only in some sense "smoother" than the PPF in problem 1). And that would have been enough for full credit.

I expected the bulk of students to stop there.

I expected some to go on, and draw the supply curve for a $10/lesson price of yoga:



and to then start walking down the supply curve and using that walking-down process to draw the exact PPF.

We know that the maximum production point of the economy—when all resources are devoted to making lattes—is (5000 lattes, 0 yoga lessons). So we have a starting point: with a $10/lesson yoga price, and a $10/latte latte price, we are at the (5000 lattes, 0 lessons) point on the PPF and the (5000 lattes, $10/latte) point on the supply curve.

Now let us walk down the supply curve to (0 lattes, $0/latte). What has happened? Well, as the price of lattes fell, people decided that they could do better teaching yoga in the gym than pulling lattes in the café, and so they exited the latte-producing business and went and taught yoga lessons instead. How many yoga lessons can they teach? We see from the supply curve that as the price of lattes falls it induces people to switch from making lattes to teaching yoga falls smoothly and linearly. Thus the average person shifts from making lattes to teaching yoga when the price of lattes falls below $5.

The average person, therefore, then makes as much money teaching $10 yoga lessons as they make making $5 lattes.

Therefore the average person can teach half as many yoga lessons as they can make lattes.

Thus when everyone has switched from making lattes to teaching yoga, the economy has moved from making 5000 lattes (and teaching 0 lessons) to teaching 2500 yoga lessons (and making 0 lattes).

Now we have both ends of the PPF.

What about the middle? How many yoga lessons are taught when 2500 lattes are produced?

To walk down the supply curve from 5000 to 2500 lattes, the price has to fall from $10 to $5/latte to induce enough people to switch to yoga to reduce the quantity supplied to 2500. That means the average person who switches in this walk-down switches when the price is $7.50/latte. That means that the average person who switches in this walk-down can make as much money teaching yoga at $10/lesson as pulling lattes when the price of lattes is $7.50/latte. The average person who switches in this walk-down can thus teach ¾ as many yoga lessons as they can make lattes. So in this walk-down the economy gives up 2500 lattes to make 1875 yoga lessons.

The middle point on the PPF, with latte production cut in half, is thus: (2500 lattes, 1875 yoga).

Can you now see the pattern and calculate the PPF?

Yes, you can see the pattern: When the price of lattes moves from $10/latte to $P/latte, the average person who switches can teach (10+P)/20 as many yoga lessons as lattes. As the price drops from $10/latte to $P/latte, the economy gives up 500(10-P) lattes from its maximum latte production and thus makes:

L = 500 - 5000(10 - P) = 500P lattes—that's the supply curve.

As the price drops from $10/latte to $P/latte, the economy makes (10+P)/20 yoga lessons for each latte it gives up, and thus makes:

Y = 500(10-P) x (10+P)/20 yoga lessons—that's the number of yoga lessons.

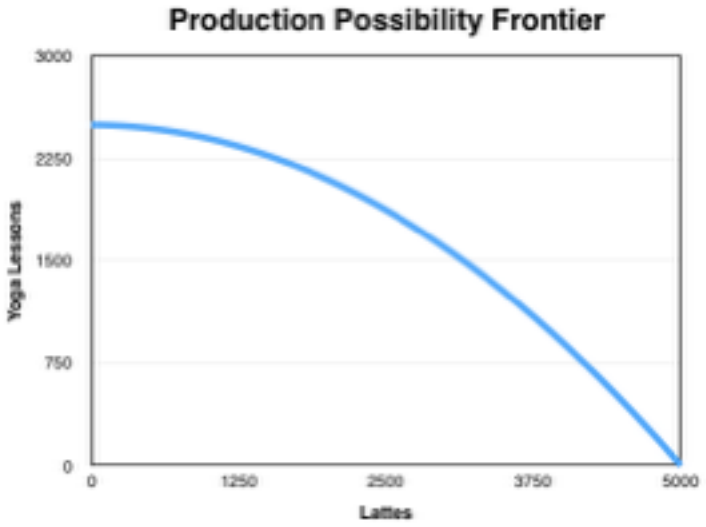
Algebra 1 then tells us:

Y = 500(10-P)(10+P)/20 = 25(100 - P^2) = 2500 - 25P^2 yoga lessons. And if you let P: \$0—>\$10 the point (L, Y) traces out the PPF.

Or simply note that \$P = L/500, and use Algebra 1 to substitute in for the equation for yoga lessons:

Y = 2500 - 25P^2 = 2500 - 25(L^2/250000) = 2500 - L^2/10000

and we are done with the exact PPF—indeed, very similar to what we did in 1), only "smoother" and having maximum yoga production of 2500 rather than 2750 yoga lessons:



And I expected a few people to draw the supply curve, and then to say: People switch from making lattes to teaching yoga when the value of the yoga lessons they can produce with those resources rises above the value of those resources making lattes. The height of the supply curve—the price—tells you the value of the latte that the economy is about to stop producing. The value of yoga lessons produced is thus simply the integral under the supply curve as the amount of lattes produced falls from 5000 toward zero:

$$V[Y] = \int_{500P}^{5000} \frac{x}{500} dx$$

$$V[Y] = \frac{(x^2)_{x=5000}}{1000} - \frac{(x^2)_{x=500P}}{1000}$$

$$V[Y] = 25000 - 250P^2$$

With the value of a yoga lesson at $10, the number of yoga lessons is:

$Y = 2500 - 25P^2$

And algebra 1 plus $L = 500P$ gets you to:

$Y = 2500 - L^2/10000$

And my question for those of us who did this third is: Why are you here in Econ 1? Why aren't you in Econ 2?

c) If the market price of yoga lessons is $10/lesson and the price of lattes is $5/latte: How many lattes are produced? How many yoga lessons do you think are taught?

At $5/latte and $10/lesson, from the supply curve 2500 lattes are produced—and from the PPF 1875 yoga lessons are taught.

d) If the market price of yoga lessons is $10/lesson and the price of lattes is $1/latte: How many lattes are produced? How many yoga lessons do you think are taught?

At $1/latte and $10/lesson, from the supply curve 500 lattes are produced—and from the PPF 2475 yoga lessons are taught.

e) If the market price of yoga lessons is $10/lesson and the price of lattes is $8/latte: How many lattes are produced? How many yoga lessons do you think are taught?

At $8/latte, from the supply curve 4000 lattes are produced—and from the PPF 900 yoga lessons are taught.

f) If the market price of yoga lessons is $20/lesson and the price of lattes is $8/latte: How many lattes are produced? How many yoga lessons do you think are taught?

The opportunity costs are the same as if yoga were $10/lesson and lattes $4/latte. And at $4/latte and $10/lesson, from the supply curve 2000 lattes are produced—and from the PPF 2100 yoga lessons are taught.

g) If the market price of yoga lessons is $40/lesson and the price of lattes is $6/latte: How many lattes are produced? How many yoga lessons do you think are taught?

The opportunity costs are the same as if yoga were $10/lesson and lattes $1.50/latte. And at $1.50/latte and $10/lesson, from the supply curve 750 lattes are produced—and from the PPF 2444 yoga lessons are taught.

h) If the market price of yoga lessons is $5/lesson and the price of lattes is $1/latte: How many lattes are produced? How many yoga lessons do you think are taught?

The opportunity costs are the same as if yoga were $10/lesson and lattes $2/latte. And at $2/latte and $10/lesson, from the supply curve 1000 lattes are produced—and from the PPF 2400 yoga lessons are taught.

3) In the economy of Avicenna, when the price of yoga lessons is $10, the supply curve for lattes is:

SUPPLY: $P = 0 + Q_s/500$

and the demand curve is:

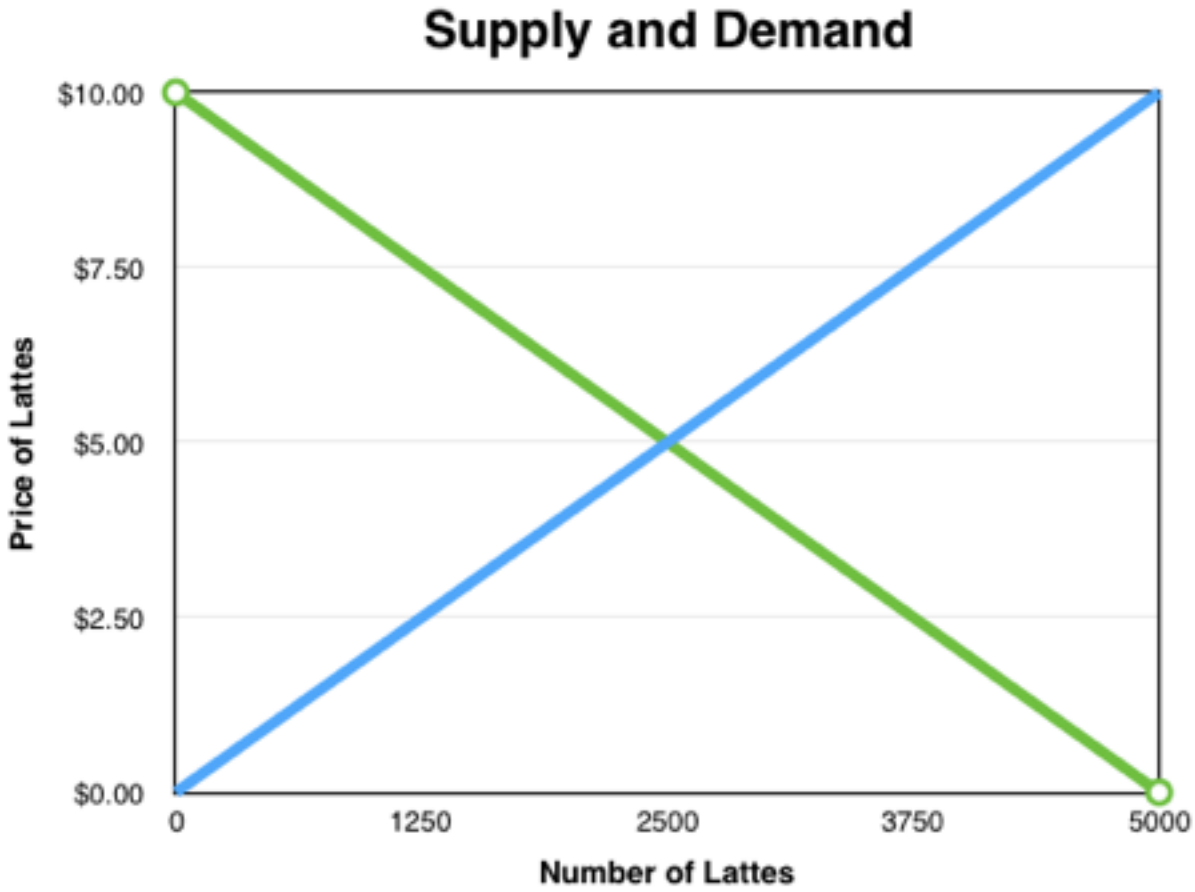
DEMAND: $P = 10 - Q_d/500$

a) On a graph, draw the supply and demand curves

The constant term in the supply curve equation is the y-axis intercept on the graph, and is the minimum opportunity cost: the MOC, our measure of who difficult and costly it is for the economy to start producing this commodity. We thus draw in the (0, $0) point on the supply curve. From the equation, when the number of lattes produced is 5000 the price is $10/latte. Draw in the (5000, $10) point on the supply curve. And since our equation is of the linear form y = b + mx (or, rather, $P = P_{s0} + sQ_s$) our supply curve is a straight line: connect (0, $0) and (5000, $10).

The constant term in the demand curve equation is the y-axis intercept on the graph, and is the maximum willingness-to-pay: the MWTP, our measure of the intensity of need in the economy for the commodity. We thus draw in the (0, $10) point on the demand curve. From the equation, when the number of lattes consumed is 5000 the price is $0/latte. Draw in the (5000, $0) point on the supply curve. And since our equation is of the linear form y = b + mx (or, rather, $P = P_{d0} + dQ_d$) our demand curve is a straight line: connect (0, $10) and (5000, $0).

And we are done.



b) What is the equilibrium price and quantity of lattes?

Read it off your graph as Q*=2500, P*= $5.

Or solve the equations setting the quantities on the supply and demand curves equal to each other at Q*:

0 + Q*/500 = P *= 10 - Q*/500
10 = Q*/250
Q* = 2500
P* = $5

c) Suppose that the government simply announced that, because wages of yoga teachers should be higher, henceforth yoga lessons would cost not $10 but $20 and made that stick. What do you think the supply curve of lattes would then be?

This changes supply: the opportunity cost in terms of money of making lattes is now twice as great. Thus the new supply curve would be P = 0 + Q_s/250

d) If the demand curve stayed the same, what would the new equilibrium price and quantity of lattes would be with yoga lesson now costing $20?

Either draw your new supply curve, and read it off the graph. Or use your Algebra 1 skillz to solve the two equations:

$P = 0 + Q_s/250$
$P = 10 - Q_d/500$

setting the supply curve and demand curve quantities equal to each other and to Q*

$0 + Q^*/250 = P = 10 - Q^*/500$
$10 = 3Q^*/500$
$5000/3 = Q^*$
$Q^*=1667$
$P^* = \$6.67$

e) Do you think the demand curve would stay the same in the event of this change? Explain why or why not. What do you think the equilibrium price and quantity of lattes would be?

I think: The production possibilities of the economy have not changed. The preferences of consumers among lattes and yoga lessons have not changed. The equilibrium number of lattes and yoga lessons produced should not have changed. So the equilibrium should still have a quantity of lattes of 2500. Since the dollar opportunity cost of making lattes has doubled, the equilibrium price should be $10. What must have happened is that now, with the price of yoga lessons higher, people have higher incomes and more cash to spend, and so the demand curve has shifted also.

But we can argue about this in section, if you wish. It's a leap. It really depends on what else is going on elsewhere in the economy. And I have not given you enough information in order for you to definitely say…

4) In the economy of Avicenna, when the price of yoga lessons is $10, the supply curve for lattes is:

SUPPLY: $P = 0 + Q_s/500$

a) What is the equilibrium price and quantity if the demand curve is: $P = 10$?

We did this: Q* = 5000 and P* = $10

b) What is the equilibrium price and quantity if demand is: $P = 10 - Q_d/500$?

We did this: Q* = 2500* and P = $5

c) What is the equilibrium price and quantity if demand is: $P = 20 - Q_d/500$?

You can do this: Q* = 5000 and P* = $10

d) What is the equilibrium price and quantity if demand is: $P = 10 - Q_d/1000$?

You can do this: Q* = 3333 and P* = $6.67

5) In the economy of Avicenna, when the price of yoga lessons is $10, the supply curve for lattes is:

SUPPLY: $P = 5 + Q_s/2000$

a) What is the equilibrium price and quantity if demand is: $P = 10 - Q_d/500$?

Q = 2000 and P = $6

b) What is the equilibrium price and quantity if demand is: $P = 20 - Q_d/500$?

Q = 6000 and P = $8

c) What is the equilibrium price and quantity if demand is: $P = 10 - Q_d/1000$?

Q = 3333 and P = $6.67

d) What is the equilibrium price and quantity if demand is: P = 10?

Q = 10000 and P = $10