Economics 3070 Answers to Practice Problems
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Make sure to label axis and indifference curves.

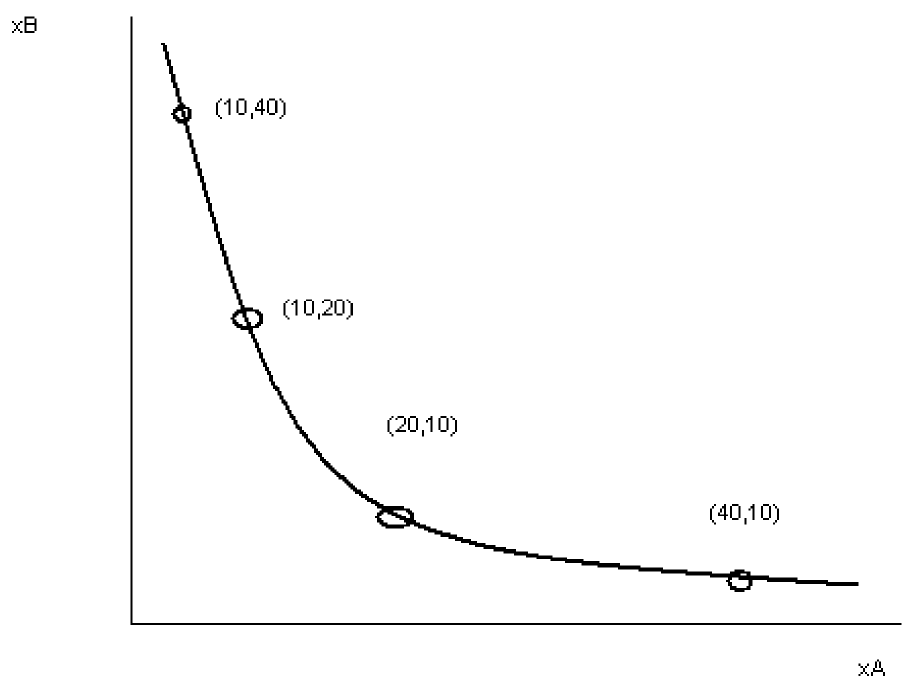
1. Fill in the table below.

$u(x_1, x_2)$	MU_1	MU_2	MRS
$2x_1 + 3x_2$	2	3	$-\frac{2}{3}$
$4x_1 + 6x_2$	4	6	$-\frac{2}{3}$
$ax_1 + bx_2$	a	b	$-\frac{a}{b}$
$2x_1^{1/2} + x_2$	$x_1^{-1/2}$	1	$-x_1^{1/2}$
$\ln x_1 + x_2$	$\frac{1}{x_1}$	1	$-\frac{1}{x_1}$
x_1x_2	x_2	x_1	$-\frac{x_1}{x_2}$
$x_1^a x_2^b$	$ax_1^{a-1}x_2^b$	$bx_1^a x_2^{b-1}$	$-\frac{ax_2}{bx_1}$
$(x_1+2)(x_2+1)$	x_2+1	x_1+2	$-\frac{1+x_2}{2+x_1}$
$(x_1+a)(x_2+b)$	x_2+b	x_1+a	$-\frac{x_2+b}{x_1+a}$
$x_1^a + x_2^b$	ax_1^{a-1}	bx_2^{b-1}	$-\frac{ax_1^{a-1}}{bx_2^{b-1}}$

2. Charlie's utility function is $U(x_A, x_B) = x_A x_B$.

(a) $U(40, 5) = 200$.

(b) $x_A x_B. = 200$. So the indifference curve through $(40, 5)$ has the equation $x_B = \frac{200}{x_A}$.



(c)

(d) Yes

(e) 10

3. Recall Shirley Sixpack and Lorraine Quiche from HW1. Shirley thinks a 16-ounce can of beers is just as good as two 8-ounce cans. Lorraine only drinks 8 ounces at a time and hates stale beer, so she thinks a 16-ounce can is not better or worse than an 8-ounce can.

   (a) $U = x_1 + \frac{1}{2}x_2$

   (b) $U = x_1 + x_2$

   (c) Yes. Yes. No.

4. Reconsider Charlie again. Recall that his utility function is $U(x_A, x_B) = x_A x_B$. Suppose that $p_A = 1$, $p_B = 2$, and $m = 40$.

   (a) $x_A + 2x_B = 40$

   (b) $x_A, x_B Max\ x_A x_B$ s.t. $x_A + 2x_B = 40$

   (c) $x_B Max\ (40 - 2x_B)x_B$

   $-2x_B + 40 - 2x_B = 0$

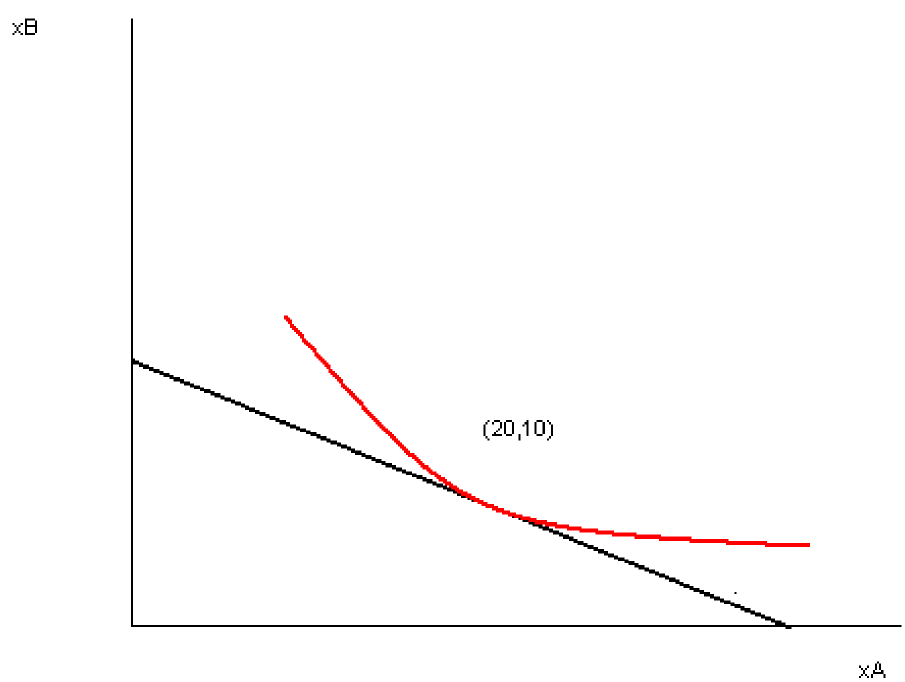
   $4x_B = 40$

   $x_B^* = 10$

   $x_A = 40 - 2x_B = 40 - 2(10) = 20$

   $x_A^* = 20$

   (d) $U(x_A^*, x_B^*) = 200$



   (e)

(f) $MRS(x_A^*, x_B^*) = -\frac{1}{2}$. slope $= -\frac{1}{2}$

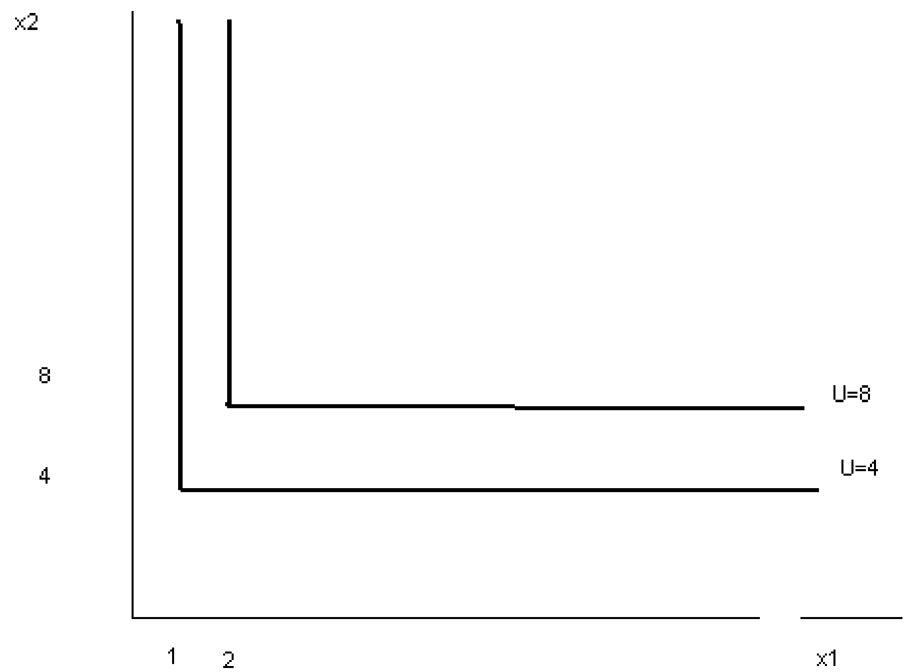
5. Calculate x^*, y^*. for the following cases.

   (a) $y^* = 6, \quad x^* = 5$

   (b) $y^* = 4, \quad x^* = 16$

6. Consider the utility function

$$U = \min\{4x_1, x_2\}$$



   (a)

   (b) $x_1^* = \frac{m}{p_1+4p_2}$ and $x_2^* = \frac{4m}{p_1+4p_2}$

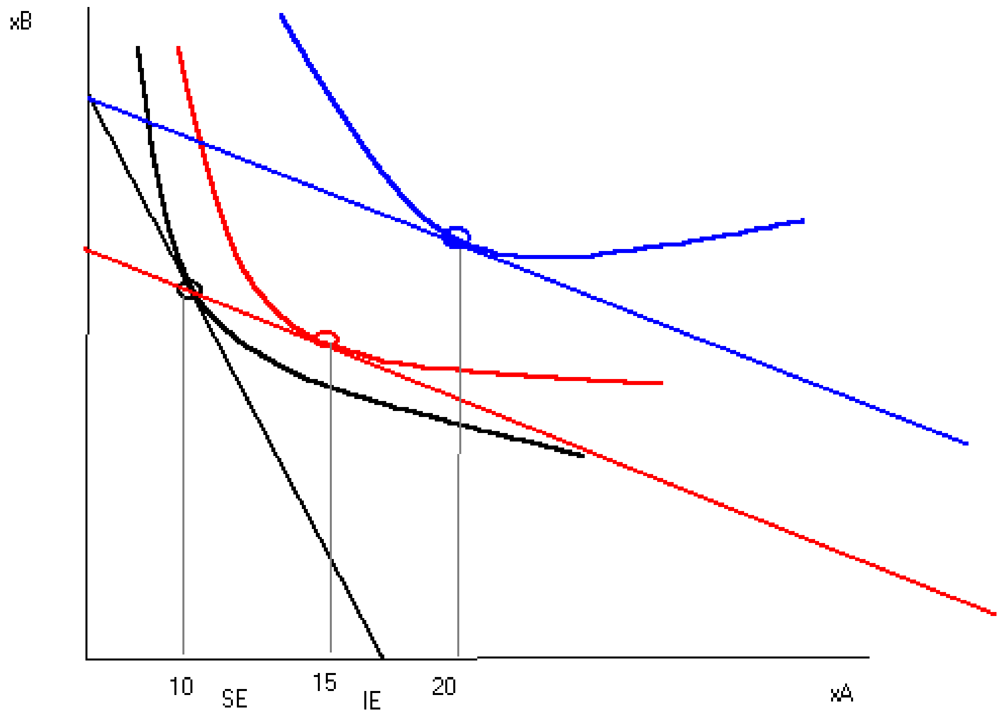
   (c) $x_1^* = 2$ and $x_2^* = 8$.

7. Consider the utility function $U(x_A, x_B) = x_A x_B$., where $p_A = 2, p_B = 1$, and $m = 40$. The price of x_A suddenly falls to \$1. x_A are apples and x_B are bananas.

(a)

$$x_B Max \left(\frac{m - p_B x_B}{p_A}\right) x_B$$

$$\begin{aligned}
\frac{m - p_B x_B}{p_A} - \frac{p_B}{p_A} x_B &= 0 \\
x_B &= \frac{m}{2p_B} \\
x_A &= \frac{m}{2p_A} \\
x_B &= 20 \\
x_A &= 10
\end{aligned}$$



(b)

$$\begin{aligned}
10 + 20 &= 30 \\
x_A &= \frac{30}{2(1)} = 15 \\
x_B &= \frac{30}{2(1)} = 15
\end{aligned}$$

bundle that Charlie would choose at this income and the new prices with the letter B.

(c) 5 more

(d)

$$\begin{aligned} x_A &= \frac{40}{2(1)} = 20 \\ x_B &= \frac{40}{2(1)} = 20 \end{aligned}$$

(e)

$$\begin{aligned} x_A x_B &= 20 * 20 = 400 \\ 400 &= \left(\frac{m}{2(1)}\right)\left(\frac{m}{2(1)}\right) \\ 400 &= \frac{m^2}{4} \\ m &= 40 \\ &\quad \text{increase} \\ &\quad \text{5 more} \end{aligned}$$

(f)

$$\begin{aligned} &\quad \text{5 more} \\ &\quad \text{5 more} \\ TE &= 10 \end{aligned}$$

8. Maude spends all her income on delphiniums and hollyhocks. She thinks that delphiniums and hollyhocks are perfect substitutes: one delphinium is just as good as one hollyhock. Delphiniums cost \$4 a unit and hollyhocks cost \$5 a unit. (Hint: sketch graphs)

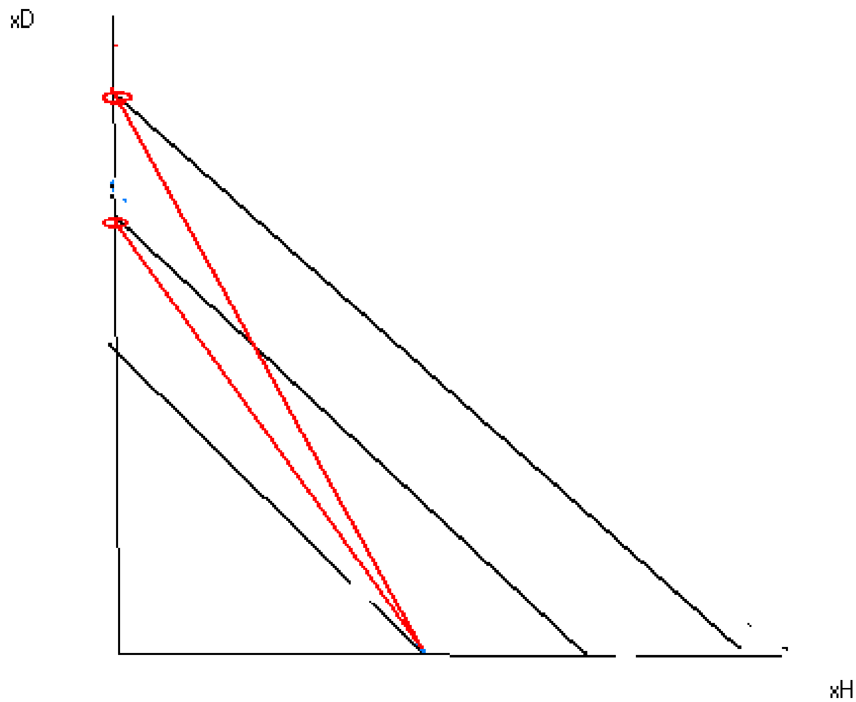
   (a)

$$\begin{aligned} U &= x_D + x_H \\ MRS &= -1 \\ 4x_D + 5x_h &= m \\ x_D &= \frac{m - 5x_H}{4} \end{aligned}$$

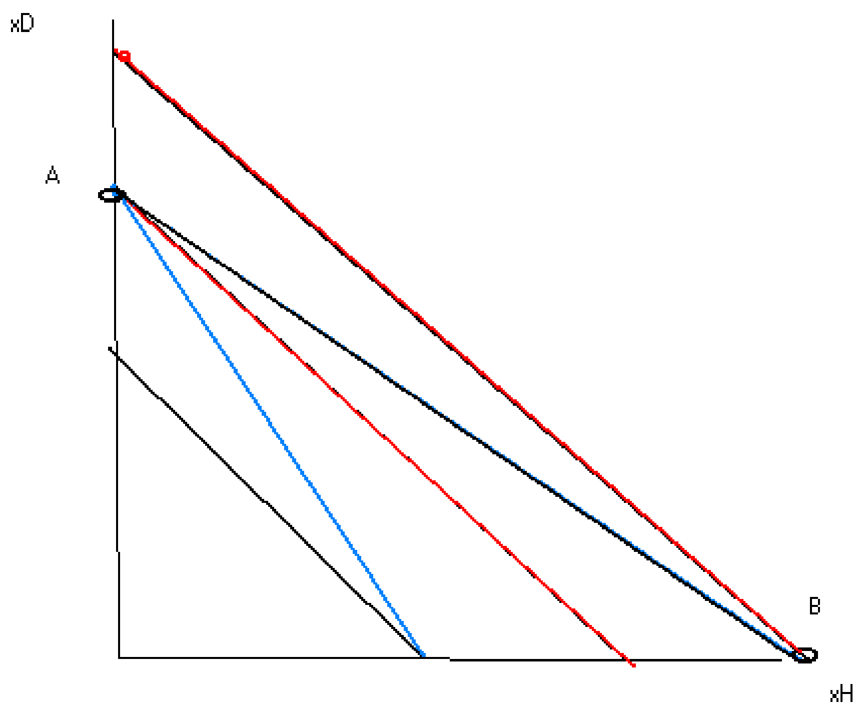
So the slope of the budget constraint is $-\frac{5}{4}$.

$$\frac{5}{4} > 1$$

So the budget constraint is steeper than the indifference curve. If the price of delphiniums decreases to \$3 a unit, budget constraint becomes even steeper.



In the graph, the indifference curves are black and the budget constaint is red. With the price decrease for delphiniums, the budget constraint swings out to the right. Maude buy more of delphiniums. All of the change in consumption is due to the substitution effect.



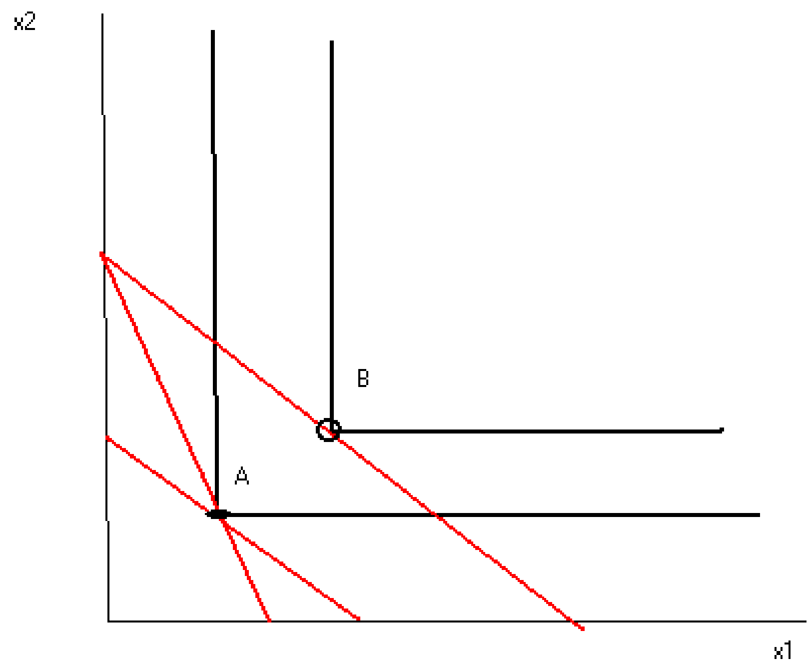
(b)

If the prices of delphiniums and hollyhocks are respectively $p_d = \$4$ and $p_h = 5$ and if Maude has \$120 to spend, draw her budget line in blue ink. Put hollyhocks on the x axis. Draw the highest indifference curve that she can attain in red ink, and label the point that she chooses as A.

(c) see above graph

(d) From graph, we can see that new budget constraint goes through both A & B, so her original bundle is still affordable.

(e) All substitution effect



9.

All due to income effect

10. Douglas Cornfield's demand function for good x is $x(p_x, p_y, m) = \frac{2m}{5p_x}$. His income is \$1000, $p_x = \$5, p_y = \$20$.

(a)

$$x = \frac{2000}{5(5)} = 80$$
$$x' = \frac{2000}{5 * 4} = 100$$

If the price of x falls to \$4, then his demand for x will change from 80 to 100.

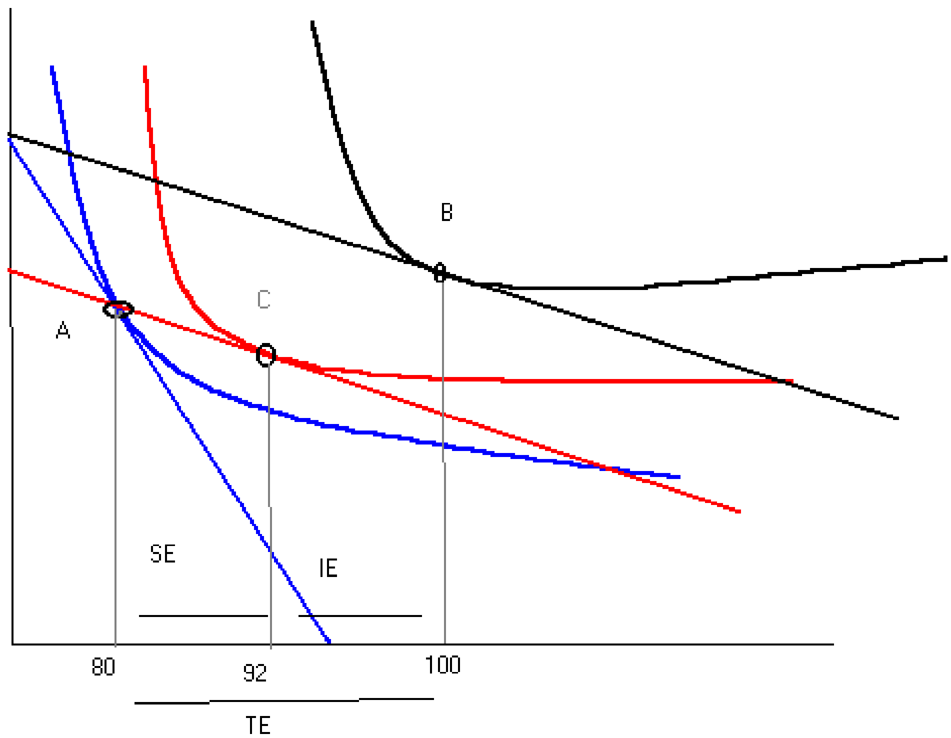
(b)

$$5(80) + 20y = 1000$$
$$y = 30$$

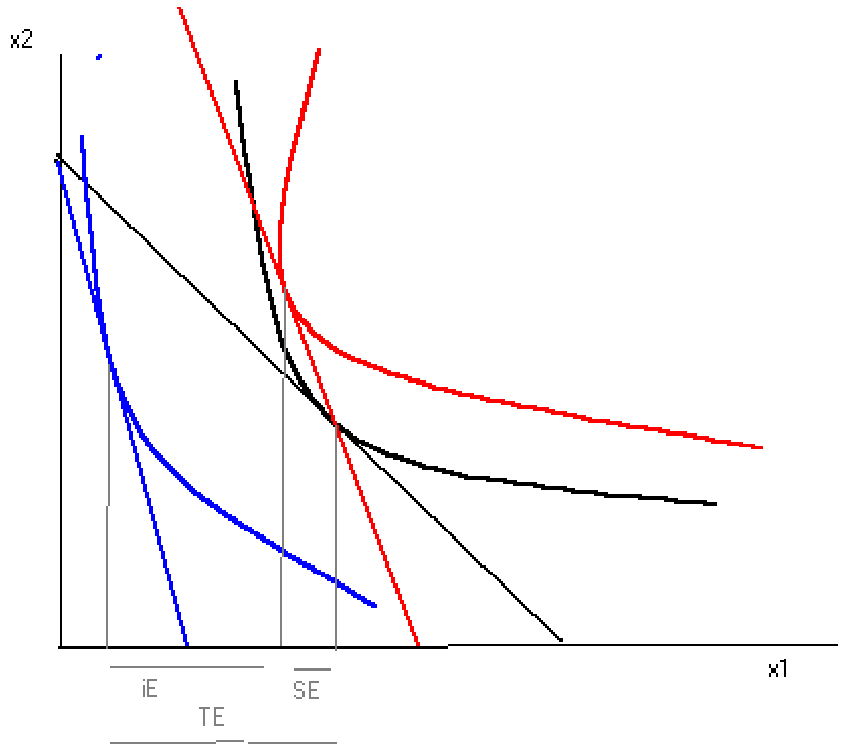
So, Douglas was spending \$30 on good y.

$$
\begin{aligned}
m &= 4(80) + 20(30) = 920 \\
x' &= \frac{2 * 920}{5 * 4} = 92
\end{aligned}
$$

(c) The substitution effect in this case is 12 and the income effect is 8



(d)



11.

12. For the case of an inferior but non-Giffen good, draw a graph that illustrates the SE, IE, and TE for an increase in price. Use 3 separate colors.

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1. For the case of a Giffen good, draw a graph that illustrates the SE, IE, and TE for an increase in price. Use 3 separate colors.

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