Part I: Multiple Choice Questions:

Question	Answer
1	A
2	B
3	C
4	A
5	A
6	C
7	D
8	C
9	D
10	C
11	D
12	B
13	B
14	A
15	B
16	C
17	D
18	B
19	B
20	C

Part II:
I answered questions: 1. Demand side, 2. Supply in a competitive market (Short run)

1. Demand side

a)

$$U(O,W) = 20W$$
$$Y = 400$$
$$P_O = 25$$
$$P_W = 25$$
$$\underline{I\ will\ be\ using\ O\ on\ the\ X-axis\ and\ W\ on\ the\ Y-axis}$$

To find Eve's marginal utility of wine I differentiate the utility with respect to W

$$U(O,W) = 20W$$

$$MU_W = 2O$$

Eve's marginal utility of wine is $MU_W = 2O$
Assuming the amount of oumph doubled, then the marginal utility of wine would double as well, as seen by the made up numbers below:

Assuming O = 10

$$MU_W(0 = 10) = 2 * 10 = 20$$

Assuming O = 20

$$MU_W(O = 20) = 2 * 20 = 40$$

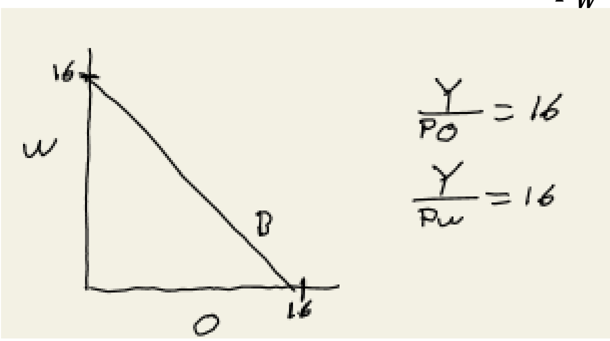
If the amount of wine were to double, it would not have an effect on marginal utility of wine

b)

$$\underset{O,W,\lambda}{Max\ \mathcal{L}} = 2OW + \lambda(400 - 25O - 25W)$$
$$(i)\frac{\partial \mathcal{L}}{\partial O} = 2W - 25\lambda = 0$$
$$(ii)\frac{\partial \mathcal{L}}{\partial W} = 2O - 25\lambda = 0$$
$$(iii)\ \frac{\partial \mathcal{L}}{\partial \lambda} = 400 - 25O - 25W = 0$$

c)

$$\boldsymbol{MRT = -\frac{P_O}{P_W} = -\frac{25}{25} = -1}$$



Finding intercepts by dividing income by price of the good on that axis.

d)

$$MRS = -\frac{MU_O}{MU_W} = -\frac{2W}{2O} = -\frac{W}{O}$$
$$U(O,W) = 2OW$$
$$MU_O = 2W$$
$$MU_W = 2O$$

$$MRT = MRS$$
$$-1 = -\frac{W}{O}$$
$$1 = \frac{W}{O}$$
$$\boldsymbol{O = W}$$

Insert the found relationship into the budget constraint to isolate for either O or W

$$400 - 25O - 25W$$
$$400 = 25O + 25W$$
$$400 = 50O$$
$$\frac{400}{50} = O$$
$$\boldsymbol{O = 8}$$
$$O = W$$
$$\boldsymbol{W = 8}$$

e)

To find out which place is preferable we need to compare them, therefore, we find the optimal bundle in each town and compare Eve's utility in each town.

Town a:

$$U(O,W) = 2OW$$
$$Budget\ constraint = 600 - 25O - 25W = 0$$

$$MRS = -\frac{MU_O}{MU_W} = -\frac{2W}{2O} = -\frac{W}{O}$$
$$MRT = -\frac{25}{25} = -\frac{1}{2}$$
$$MRT = MRS$$
$$-1 = -\frac{W}{O}$$
$$O = W$$
$$Insert\ into\ new\ budget\ constraint\ to\ find\ optimal\ bundle$$

$$Budget\ constraint = 600 - 25O - 25W = 0$$
$$600 = 25O + 25W$$
$$600 = 50O$$
$$\frac{600}{50} = O$$
$$\boldsymbol{O = 12}$$
$$O = W$$
$$\boldsymbol{W = 12}$$

$$Plug\ optimal\ bundle\ into\ utility\ function\ to\ calculate\ utility\ at\ that\ bundle$$

$U(O,W) = 2OW$
$U(12{,}12) = 2 * 12 * 12 = 288$
$\boldsymbol{Eve's\ utility\ if\ she\ were\ to\ live\ in\ town\ A\ would\ be\ 288}$

We not repeat the process for town b
Town b:

$U(O,W) = 2OW$
$Budget\ constraint = 400 - 20O - 13W = 0$

$MRS = -\frac{MU_O}{MU_W} = -\frac{2W}{2O} = -\frac{W}{O}$
$MRT = -\frac{p_o}{p_w} = -\frac{20}{13} = -1.5385$
$MRT = MRS$
$-1.5385 = -\frac{W}{O}$
$1.5385 = \frac{W}{O}$
$1.5385O = W$

$Insert\ into\ budget\ constraint\ to\ find\ optimal\ bundle$
$Budget\ constraint = 400 - 20O - 13W = 0$
$400 = 20O + 13W$
$400 = 20O + 13 * 1.5385$
$400 = 40O$
$\boldsymbol{O = 10}$
$W = 1.5385O$
$10 * 1.5385 = W$
$\boldsymbol{W = 15.385}$

$Plug\ optimal\ bundle\ into\ utility\ function\ to\ calculate\ utility\ at\ that\ bundle$
$U(O,W) = 2OW$
$U(10{,}15.385) = 2 * 10 * 15.385 = 307.7$
$\boldsymbol{Eve's\ utility\ if\ she\ were\ to\ live\ in\ town\ B\ would\ be\ 307.7}$

$\boldsymbol{Eve\ would\ therefore\ move\ to\ town\ B, as\ she\ gets\ more\ utility\ from\ her\ optimal\ bundle\ in\ town\ B\ than\ in\ town\ A}$

2. Supply side in a competitive market (Short run)

a)

A competitive firm will operate in the short run, if price exceeds AVC.

$VC = 0.1q^2 + 5q$
$AVC = 0.1q + 5$
$MC = 0.2q + 5$

$$Set\ equal\ to\ find\ minimum\ price\ necessary\ to\ produce$$
$$0.1q + 5 = 0.2q + 5$$
$$q + 50 = 2q + 50$$
$$0 = q$$

Plug into AVC

$$AVC = 0.1q + 5$$
$$AVC = 0.1 * 0 + 5$$
$$\boldsymbol{Rosa\ will\ participate\ if\ p > 5}$$

b)

In the short run a firm's supply function = MC

$$\mathrm{MC} = 0.2\mathrm{q} + 5$$
$$\mathrm{P} - 5 = 0.2\mathrm{q}$$
$$0.2\mathrm{q} = \mathrm{P} - 5$$
$$\mathrm{q_S} = -25 + 5\mathrm{P}$$

$$Multiply\ q_s\ with\ 20\ to\ find\ market\ supply$$
$$\mathbf{Q_S = -500 + 100P}$$

c)

$$Q_D = 900 - 100P$$
$$Set\ equal\ to\ Q_S\ to\ find\ market\ equilibrium$$
$$-500 + 100P = 900 - 100P$$
$$200P = 1400$$
$$\boldsymbol{P = 7}$$
$$Set\ P\ into\ either\ Q_D\ or\ Q_S\ to\ find\ Q$$
$$\mathrm{Q_S} = -500 + 100\mathrm{P}$$
$$Q_S = -500 + 100 * 7$$
$$\boldsymbol{Q_S = 200}$$

d)

Since there are 20 firms in the market we devide Q_S *by* 20 *to find* q_S

$$Q_S = 200$$
$$\frac{200}{20} = 10$$
$$\boldsymbol{q = 10}$$

Rosa's optimal production will be 10 given a market price of 7

$$\pi = TR - TC$$
$$TR = q * P$$
$$TR = 10 * 7 = 70$$
$$TC = 0.1q^2 + 5q + 250$$
$$TC = 0.1 * 10^2 + 5 * 10 + 250$$
$$TC = 10 + 50 + 250 = 310$$
$$\boldsymbol{\pi = 70 - 310 = -240}$$

Therefore, Rosa would make a loss of 240.

To see whether Rosa would participate in the market, we remove fixed costs as they aren't avoidable in the short run. Therefore, we plug q = 10 into our AVC to *see whether the AVC is above P. If P>AVC then Rosa lowers her loss by producing.*

$P = 7$
$AVC = 0.1q + 5$
$AVC(q = 10) = 0.1 * 10 + 5$
$AVC(q = 10) = 6$
$Short - run\ profit\ per\ unit = P - AVC$
$Short - run\ profit\ per\ unit = 7 - 6 = 1$
$\boldsymbol{Rosa\ would\ therefore\ produce\ at\ q = 10, P = 7, as\ she\ lowers\ her\ loss\ by\ 1\ per\ unit\ she\ sells}$

$Assuming\ q = 0$
$\pi = TR - TC$
$TR = 0$
$TC = 0.1q^2 + 5q + 250$
$TC = 250$
$\pi = 0 - 250 = -250$
$\boldsymbol{Her\ short\ run\ loss\ would\ therefore\ be\ 10\ less\ when\ she\ produces\ than\ if\ she\ were\ not\ to\ produce}$

e)
P = 25
Plug 25 into Rosa's supply function to find q

$q_S = -25 + 5P$
$q_S = -25 + 5 * 25$
$q_S = 100$

$\pi = TR - TC$
$TR = q * P$
$TR = 100 * 25$
$TR = 2500$
$TC = 0.1q^2 + 5q + 250$
$TC = 0.1 * 100^2 + 5 * 100 + 250$
$TC = 1000 + 500 + 250$
$TC = 1750$

$\pi = 2500 - 1750 = 750$
$\boldsymbol{\pi = 750}$

In the long run, there are no profits to be made in perfect competition. As we have just calculated, there is profit to be made in the short run. Therefore, we can expect the price to fall until the firms make no profits.