Thursday Sept. 4^{th} 2014

Problem 1

$C(x)$ = cost function (\$)

$R(x)$ = Revenue function (\$)

$P(x)$ = Profit function (\$)

F = fixed cost (\$)

C = production cost (\$/unit)

S = selling Price (\$/unit)

$$\boxed{\begin{aligned} C(x) &= cx + F = .60x + 12,100 \\ R(x) &= Sx = 1.15x \\ P(x) &= R(x) - C(x) = .55x - 12,100 \end{aligned}}$$

Problem 2

Let t denote the time ~~ep~~ elapsed (yr) & $V(t)$ denote the value of the asset at time t. Since the depreciation is linear, $V(t)$ should be modeled as a line. Two point of the line are Known $(0, C)$ and (N, S). So the slope is given by

$$m = \cancel{\Delta y} \frac{\Delta V}{\Delta t} = \cancel{S-S} \frac{S-C}{N-0} = \frac{S-C}{N}.$$

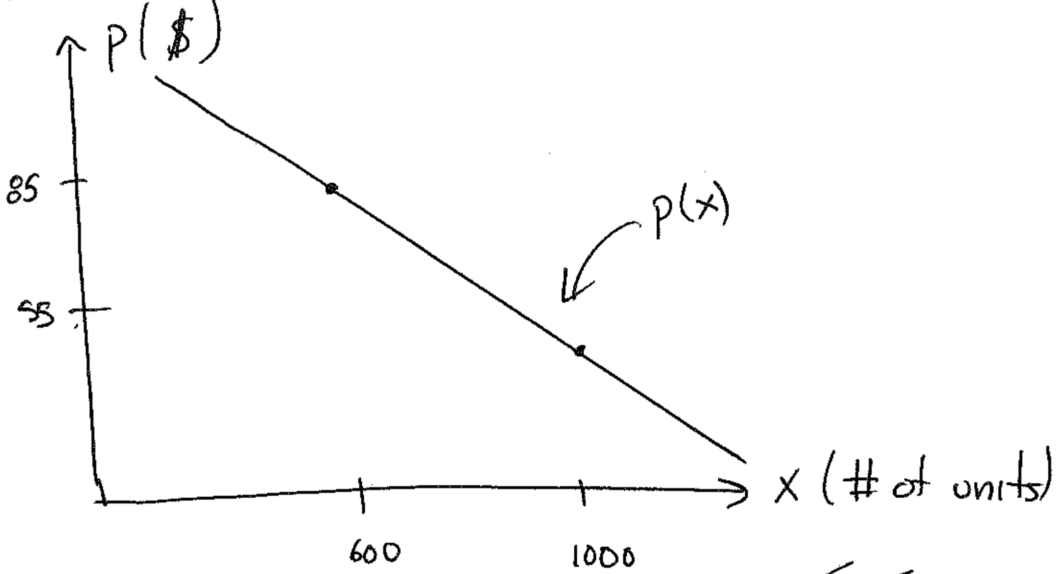
By the point-slope form for the equation of a line

$$V - V_0 = \cancel{m(x - x_0)} \; m(t - t_0)$$

$$V - C = \frac{S-C}{N} t$$

$$\boxed{V(t) = C + \left(\frac{S-C}{N}\right) t}$$

Problem 3



The slope is given by $m = \frac{\Delta P}{\Delta x} = \cancel{\frac{85-55}{1000-6}}\ \frac{85-55}{600-1000} = \frac{30}{-400} = \frac{-3}{40}$

By the point-slope form for the equation of a line, the demand is given by

$$\boxed{P(x) = 55 - \frac{3}{40}(x-1000) = -\frac{3}{40}x + 130}$$

Demand is zero when the graph crosses the p-axis, so demand is zero when the price is $\boxed{\$130}$

The product is free when the graph crosses the x-axis. Find the x-intercept by setting p equal to zero and solving for x. The product is free when the quantity is $\boxed{1734}$

Problem 4

The break even point (x_0, P_0) is where ~~$R(x_0) = C$~~ $R(x)$ and $C(x)$ intersect. The revenue $R(x) = 9x$, and the cost is

$C(x) = (.4)(9)x + 50{,}000 = 3.6x + 50{,}000$. Setting $R(x) = C(x)$,

or $(R(x) - C(x) = 0)$

$$9x = 3.6x + 50{,}000$$

$$5.4x = 50{,}000$$

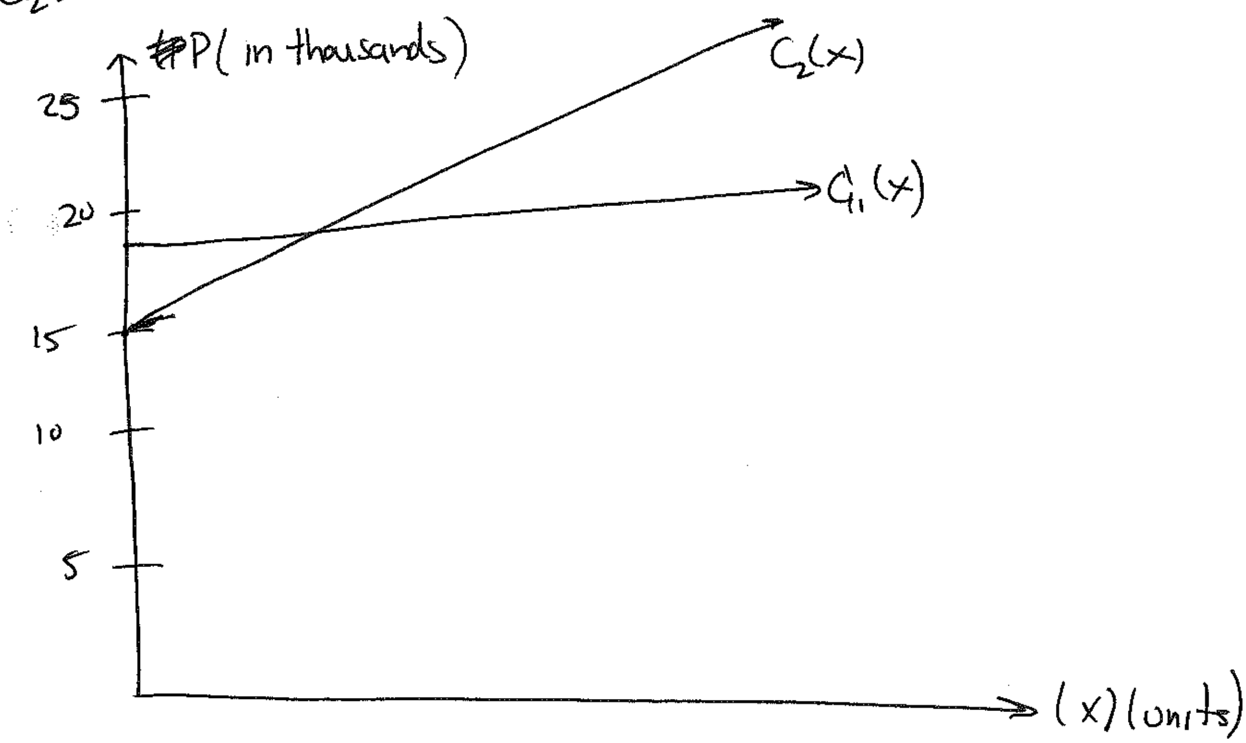
$$x = \frac{50{,}000}{5.4} \approx 9259.26$$

The corresponding break even price is given by substituting the break even quantity into $R(x)$ or $C(x)$. In any case the break even point is $\boxed{(9259.26,\ 83{,}333.34)}$

Problem 5

a) C_1 = cost function w/ machine I $= 18{,}000 + 15x$

C_2 = cost function w/ machine II $= 15{,}000 + 20x$



b) $R(x)$ = Revenue Function $= 50x$.

$P_1(x)$ = ~~proff~~ profit of machine I $= 35x - 18{,}000$

P_2 = profit of machine II $= 30x - 15{,}000$

x	$P_1(x)$	$P_2(x)$
450	-2250	-1500
550	1250	1500
650	4750	4,500

In the case of 450 units, use machine ~~2~~II because it operates with smaller losses, -$1500. In the case of 550 units use machine II because it has more profits, $1500. In the case of 650 units use machine I because it has more profits, $4750.

Problem 6

a) Set the equilibrium price & quantity equal to one another. So

$$-|a|x + b = cx + d$$

$$b - d = (c + |a|)x$$

$$x_{eq} = \frac{b-d}{c+|a|}$$

b)

$$x_{eq} = \frac{b-d}{c+|a|}$$

$$\cancel{p(x_{eq}) = cx_{eq} + d}$$

$$\cancel{= \frac{c(b-d)}{c+|a|} + d}$$

If c is increased the equilibrium quantity decreases & the equilibrium price increases.