Math 150 Name: KEY
Business Applications
(Section 1.2– 1.6)

1) The Dogs-R-Us Company has calculated the cost to build doghouses to be \$50 each, plus a one-time set-up cost of \$2100. They plan to sell each doghouse for \$75.

$x = \#$doghouses

a) Find the cost function C(x) $\boxed{C(x) = 50x + 2100}$

b) Find the revenue function R(x) $\boxed{R(x) = 75x}$

c) Find the Profit function P(x) $P(x) = 75x - (50x + 2100)$

$\boxed{P(x) = 25x - 2100}$

d) How many doghouses must be sold for them to break-even?

84 doghouses must be sold to breakeven

$P(x) = 0$
$25x - 2100 = 0$
$25x = 2100$
$x = 84$

e) Evaluate and Interpret P(250)

$P(250) = 4150$

The profit from selling 250 doghouses is \$4150

f) Find and Interpret the average rate of change from x =100 to x = 150

AR of C in Profit $= \dfrac{1650 - 400}{50} = 25$

AR of C in Cost $= 50$

when you sell from 100 to 150 dog houses the profit is increasin on average \$25/doghouse

2) Joe's TV produces HD TV's. They have determined their cost function to be: $C(x) = -2x^2 + x + 10$, while their revenue function is $R(x) = x^2 + 9x - 6$. If x is the number of HD TV's produced find each:

a) The profit function P(x) $P(x) = x^2 + 9x - 6 - (-2x^2 + x + 10)$

$\boxed{P(x) = 3x^2 + 8x - 16}$

b) P(2) and P(10) and interpret

$P(2) = 12$
$P(10) = 364$

The profit for selling 2 TV's is \$12
" " " " 10 TV's is \$364

c) P '(x)

$\boxed{P'(x) = 6x + 8}$

d) P'(2) and P'(10) and interpret

$P'(2) = 20$
$P'(10) = 68$

When selling 2 TV's the profit is increasin \$20/TV

When selling 10 TV's the profit is increasing \$68/TV

3) An appliance manufacturer has determined that the cost, in dollars, of producing x espresso makers is $C(x)=3800+1.6x^{0.5}$. If the revenue from the sale of x espresso makers is given by $R(x)=52x^{0.9}$, find the rate at which the average profit per espresso maker is changing when 70 espresso makers have been made and sold. Round to the nearest cent. (Interpret your answer)

$P(x) = 52x^{.9} - (3800 + 1.6x^{.5})$

$P(x) = 52x^{.9} - 1.6x^{.5} - 3800$

$AP(x) = \dfrac{52x^{.9} - 1.6x^{.5} - 3800}{x}$

$AP'(x)$ (QUOTIENT RULE)

$= \dfrac{(46.8x^{-.1} - .8x^{-.5})x - 1(52x^{.9} - 1.6x^{.5} - 3800)}{x^2}$

$= \dfrac{46.8x^{.9} - .8x^{.5} - 52x^{.9} + 1.6x^{.5} + 3800}{x^2}$

$AP'(x) = \dfrac{-5.2x^{.9} + .8x^{.5} + 3800}{x^2}$

$AP'(70) = .73$

$\boxed{\text{when 70 expresso makers are sold the Ave Profit is increasing \$.73/maker}}$

4) Algebraically, Find the equation for the tangent line to $f(x)=\dfrac{-2x^2+6}{-3x-2}$ at x = 0

at point $(0,-3)$

find slope:

$f' = \dfrac{-4x(-3x-2) - (-3)(-2x^2+6)}{(-3x-2)^2}$

$f' = \dfrac{12x^2 + 8x - 6x^2 + 18}{(-3x-2)^2}$

$f' = \dfrac{6x^2 + 8x + 18}{(-3x-2)^2}$

slope at $x=0$: $f'(0) = \dfrac{18}{4} = \dfrac{9}{2} = m$

$y - y_1 = m(x - x_1)$

$y - (-3) = \frac{9}{2}(x - 0)$

$y + 3 = \frac{9}{2}x$

$\boxed{y = \frac{9}{2}x - 3}$ ← equation of Tan Line