Group Quiz 2
Dusty Wilson
Math 111

Name: Key

No work = no credit

1.) A certain company has fixed costs of \$15,000 for its product and variable costs given by $140+0.04x$ dollars per unit, where x is the total number of units. The selling price of the product is given by $300-0.06x$ dollars per unit.

a.) Formulate the functions for total cost, revenue, and profit.

$C(x) = (140+0.04x)x + 15000 = 0.04x^2 + 140x + 15000$

$R(x) = (300-0.06x)x = -0.06x^2 + 300x$

$P(x) = -0.1x^2 + 160x - 15000$

b.) Algebraically find and interpret the break even points.

solve $0 = -0.1x^2 + 160x - 15000$

$$x = \frac{-160 \pm \sqrt{25600 - 4(-0.1)(-15000)}}{2(-0.1)}$$

$x = 100$ OR $x = 1500$

They breakeven when 100 OR 1500 units are sold.

c.) Algebraically find and interpret the level of production and sales that maximizes profit.

$x = 800$

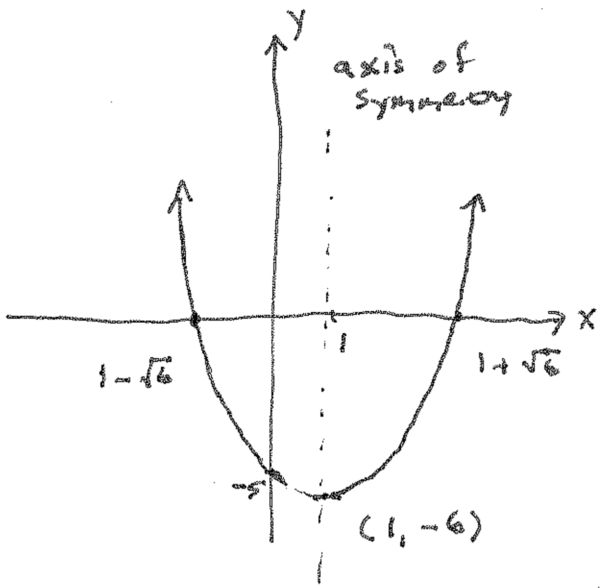
$P(800) = 49000$

The company has a max profit of \$49000 when 800 units are sold.

d.) Find and interpret the profit at the production level found in (c.)

see above

2.) **Carefully sketch a graph of $f(x)=x^2-2x-5$ being sure to find and label the axes, vertex, axis of symmetry, y-intercept, zeros, domain, and range. Use algebraic methods giving exact answers. You may check ~~your work~~ with your calculator.**



$0 = x^2 - 2x - 5$

$x = \dfrac{2 \pm \sqrt{4 - 4(1)(-5)}}{2(1)}$

$= \dfrac{2 \pm \sqrt{24}}{2}$

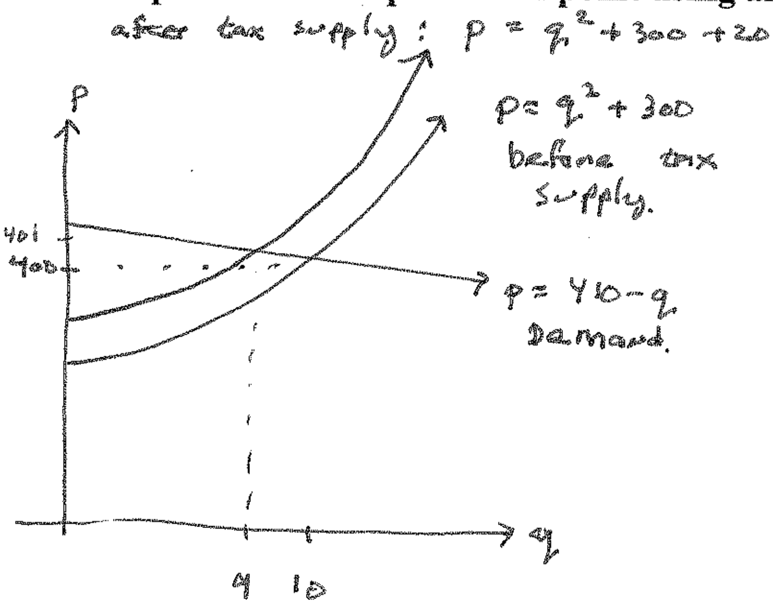
$= 1 \pm \sqrt{6}$ $\boxed{\text{zeros}}$

$x = 1$, $y = -6$ $\boxed{\text{vertex}}$

Domain: $(-\infty, \infty)$

Range: $[-6, \infty)$

3.) **Consider $p=q^2+300$ and $p+q=410$ which represent demand and supply. Use your calculator to plot this and determine which is which and to find market equilibrium (label your axes). Now if a \$20 tax is placed on the production of each item and passed on to the consumer by the supplier, find and interpret the new equilibrium point using algebraic methods.**



before tax equilibrium @ (10, 400).

$q^2 + 320 = 410 - q$

$\Rightarrow q^2 + q - 90 = 0$

$\Rightarrow (q+10)(q-9) = 0$

$\Rightarrow q \cancel{=} -10$ or $q = 9$

and $p = 401$,

After the tax, we reach market equilibrium when 9 units are sold for \$401/ea.