

Group Quiz 2
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Math 111 - Spring 2012

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.

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

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

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

b.) Find and interpret the break even points.

solve $P(x) = 0$.

The company breaks even
when 100 or 1500 units
are sold/produced.

$$\Rightarrow 0 = -0.1x^2 + 160x - 15000$$

$$\Rightarrow 0 = x^2 - 1600x + 150000$$
$$= (x - 1500)(x - 100)$$

$$\Rightarrow x = 100 \text{ OR } x = 1500$$

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

vertex of $P(x)$.

$$x = \frac{-160}{2(-0.1)}$$

$$= 800$$

Maximize profit by
producing and selling
800 units.

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

$$P(800) = 49000$$

The max possible profit is
\$49,000 when 800 units
are sold.

2.) The table gives the median age of women who first marry in the given year.

Find the best model $M(x)$ for the data set (given the options available on the calculator) where x is in years since 1900. To 2 ^{sig. figs.} decimal places.

Year	Females
1900	21.9
1910	21.6
1920	21.2
1930	21.3
1940	21.5
1950	20.3
1960	20.3
1970	20.8
1980	22
1990	23.9
2000	25.1
2010	26.1

Use the model to find and interpret $M(200)$.

$$\text{cubic: } f(x) = 0.0000087x^3 - 0.00027x^2 - 0.034x + 22$$

$$\text{quartic: } g(x) = -0.00000030x^4 + 0.000076x^3 - 0.0049x^2 + 0.068x + 21.7$$

$$f(200) = 74.206 \quad \text{and} \quad g(200) = -41.69$$

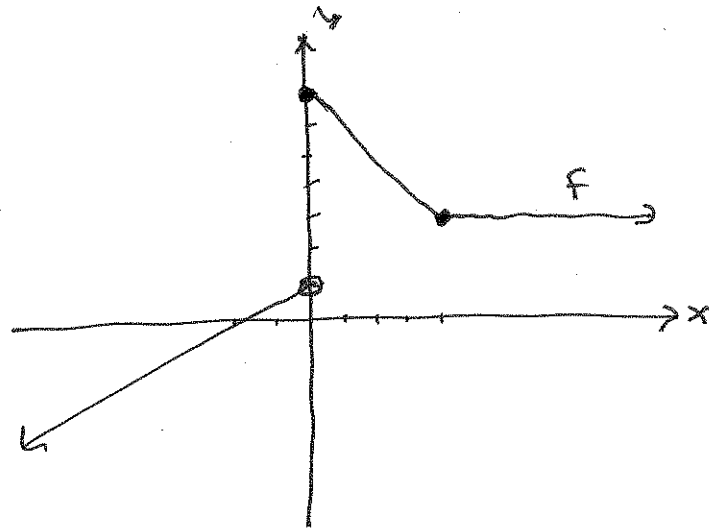
women who first marry in the year 2100 will have median age 74 or -42 based upon our models. Neither of these make sense because of extrapolation.

$$3.) \text{ Consider } f(x) = \begin{cases} \frac{1}{2}x + 1 & \text{if } x < 0 \\ 7 - x & \text{if } 0 \leq x < 4 \\ 3 & \text{if } x \geq 4 \end{cases}$$

a.) Find $f(0)$ and $f(6)$.

$$f(0) = 7 \quad \text{and} \quad f(6) = 3$$

b.) Carefully sketch a graph of f .



c.) Range.

$$(-\infty, 1) \cup [3, 7]$$