Name: _____   Section: _____

You have 10 minutes to complete the quiz. Please **show all work**, and then **write your answer on the line provided.**

1. Suppose your company makes an <u>investment of $10,000</u> which accrues interest at a fixed <u>5%</u> <u>interest per year</u>, <u>compounded quarterly</u>.

   (a) Write a function $F(t)$ which gives the value of the loan after t years.

$$F(t) = 10,000 \cdot \left(1 + \frac{0.05}{4}\right)^{4t}$$

1pt

Because
$$FU = PV \cdot \left(1 + \frac{r}{m}\right)^{mt}$$

   (b) Use laws of exponents to write $F(t)$ as a base b exponential function $\left(F(t) = P \cdot b^t\right)$.

$$a^{r \cdot s} = \left(a^r\right)^s$$

$$F(t) = 10\,000 \cdot \left(1.0125\right)^{4t}$$

2pt

$$= 10\,000 \cdot \left(\left(1.0125\right)^4\right)^t$$

$$= 10\,000 \cdot \left(1.050945\right)^t$$

   (c) What is your effective annual interest rate?

$$5.0945\% \quad \text{effective APR}$$

1pt

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$$P(100) = 11 \qquad\qquad P(200) = 1$$

2. Suppose you find that you can sell 100 pins at $11 per pin, and 200 pins at $1 per pin.

(a) Assuming that demand is linear, find a function for the price $p(x)$ as a function of the number of units demanded.

$$P(x) = m(x - x_1) + y_1$$

1pt

$$m = \frac{\Delta y}{\Delta x} = \frac{11 - 1}{100 - 200} = \frac{10}{-100} = \frac{-1}{10}$$

2pt

$$P(x) = \frac{-1}{10}(x - 100) + 11 = \frac{-1}{10}x + \frac{100}{10} + 11$$

$$\boxed{P(x) = \frac{-1}{10}x + 21}$$

(b) Find a function for the revenue of selling x units.

$$R(x) = p \cdot x = \left(\frac{-1}{10}x + 21\right) \cdot x$$

1pt

$$R(x) = \frac{-1}{10}x^2 + 21x$$

(c) If your cost function is $C(x) = 10 + 18x$, find a function for the profit of selling x units.

$$P(x) = R(x) - C(x) = \left(\frac{-1}{10}x^2 + 21x\right) - (10 + 18x)$$

1pt

$$= \frac{-1}{10}x^2 + 21x - 10 - 18x = \boxed{\frac{-1}{10}x^2 + 3x - 10}$$

(d) Sketch the profit function. Label the break-even quantities and the quantity that produces the maximum profit.

1pt

quantity that maximizes profit

break even quantities