Name: Solution

Student ID #:

Each problem of #1-#3 is worth 5 points.

1. Determine the slope and the vertical intercept of the line given by $-4y + 2x + 8 = 0$.

   \[-4y = -2x - 8\]
   \[y = \frac{1}{2}x - 2\]
   \[y = \frac{1}{2}x + 2\]

   $\Rightarrow$ \hspace{1cm} \text{slope} = \frac{1}{2} \hspace{1cm} \text{and} \hspace{1cm} \text{the vertical intercept} = 2.

2. Find a formula for the population $P(t)$ at time $t$ in a town if the population at $t = 0$ is 2000 and increases by 3% a year.

   \[y = 0.03. \hspace{1cm} \Rightarrow \hspace{1cm} a = 1 + r = 1.03. \hspace{1cm} \& \hspace{1cm} p_0 = 2000\]

   \[P(t) = 2000 \cdot (1.03)^t\]

3. Find break-even-points when the cost function $C(q) = 10q - 100$ and the revenue function $R(q) = 500 - 20q$.

   \[\text{Find } q \text{ when } C(q) = R(q).\]
   \[\Rightarrow \hspace{1cm} 10q - 100 = 500 - 20q\]
   \[\Rightarrow \hspace{1cm} 10q + 20q = 500 + 100\]
   \[\Rightarrow \hspace{1cm} 30q = 600\]
   \[\Rightarrow \hspace{1cm} q = 20.\]

   \[\text{So break-even point is at } q = 20.\]

4. (Bonus problem, 1 pt) Determine whether the following statement is true or not.

   If the average rates of change of the function $y = f(t)$ between $t = 0$ and $t = 1$, and between $t = 1$ and $t = 2$ are 3 and 2, respectively, then the graph of $y = f(t)$ between $t = 0$ and $t = 2$ is both increasing and concave down.

   \[\text{True.}\]

   \[\text{Why? Both rates of change are positive so the graph is increasing.}\]
   \[\text{And the rate of change between } 0 \& 1 \text{ is 3 which is bigger than the next rate which is 2. So the rate of change is decreasing.}\]
   \[\text{Then the graph is concave down.}\]