## Collaborative Project – Functions and Their Graphs

1. You are a plow truck operator for a snow removal company. Your weekly hours are based on weather conditions. You earn $30 per hour for up to 40 hours and you are limited to at most 10 hours of overtime at one and one-half times your base pay rate.

   a. Write and graph a piecewise-defined function $E(x)$ that gives your earnings E for working x hours in one week. Are your earnings ever directly proportional to the number of hours you work? Explain.

   b. Find your weekly earnings when you work 35 hours and when you work 50 hours.

   c. Find and interpret the slope of each segment of the graph of $E(x)$.

   d. Find and interpret the intercepts of the graph of $E(x)$.

   e. You earn $1515 in one week. How many hours did you work?

2. Your company orders a load of rock salt at a price of $85 per ton. There is a delivery charge of $95 and sales tax of 7%.

   a. Explain what the function $d(x) = 85x + 95$ represents.

   b. Write a function $c(x)$ for the total cost of an amount of x dollars with a 7% tax added.

   c. Find and interpret $(d \circ c)(x)$ and $(c \circ d)(x)$.

   d. There is no tax on the delivery fee. Find your company's total cost for 13 tons of salt.

3. The graph of function F shows the approximate weekly revenues y of your company from last year. The graph of function P shows your company's projected weekly revenues y for this year. In each graph, x represents the week, with $x = 0$ corresponding to the first full week in October.

   Revenues Last Year

   Projected Revenues This Year
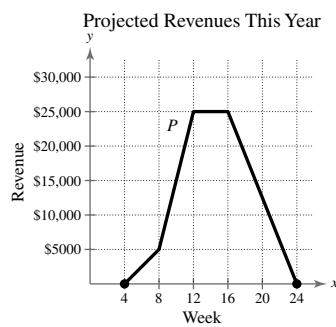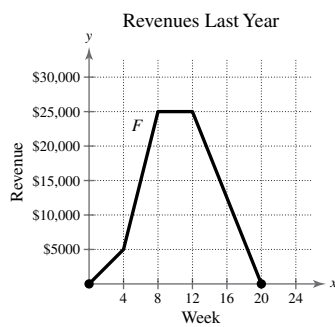
   a. Seasonal weather forecasts were used to create P. What can you conclude about these forecasts? Use the concepts of transformations of graphs to write P in terms of F.

   b. Determine the open intervals on which the function P is increasing, decreasing, or constant.

   c. Find the midpoint of the segment on which the graph of P decreases. Interpret the coordinates of this point.

4. Your company purchases a truck for $60,000 that is worth $22,800 after 6 years. Find the average rate of change. Then write a linear function $f(x)$ for the value f of the truck after x years. Find the inverse function $f^{-1}(x)$ of f. Then find and interpret $f^{-1}(35,200)$.