Week 10 Homework: Review for the Final
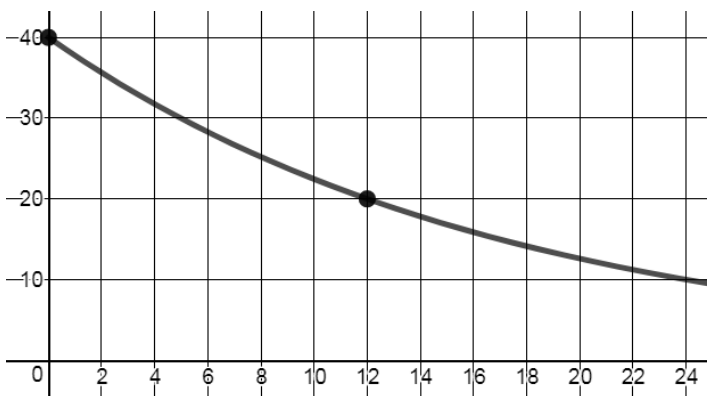
Directions. Work on the following problems on a separate sheet of paper. If you finish this worksheet and upload your solution as a single PDF document into Canvas under Homework 10 by December 13th , you will receive 20 extra credit points. The entire worksheet must be completed neatly with work shown on every problem to receive credit.

1. Suppose $\cos(y) = -\frac{x^2}{4}$ and suppose y is in the third quadrant.
   a. Calculate the values of the other five trig functions.
   b. You may have talked in class about two identities that are called the **double angle identities.** Here they are if you have not talked about them:
   $$\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta) \qquad \sin(2\theta) = 2\sin(\theta)\cos(\theta)$$
   Use these identities and your answers to part (a) to calculate $\cos(2y)$ and $\sin(2y)$.

2. Consider the functions $f(x) = 2(x-1)^3 + 4$ and $g(x) = \frac{1}{2}\sqrt[3]{x-4} + 1$.
   a. Sketch the graphs of $f(x)$ and $g(x)$.
   b. Calculate $f(2)$ and solve $g(x) = 5$.
   c. Calculate the average rate of change of $f(x)$ on the interval $[1, 1+h]$.
   d. Calculate $f(g(x))$ and $g(f(x))$. Is $f(x) = g^{-1}(x)$? Explain.

3. The graph at right shows the amount of a radioactive sample that remains after t minutes
   a. Find a formula for the amount, A, of the sample that remains after t minutes.
   b. Find the half-life of the substance.
   c. What percent of the substance decays every minute?

4. Calculate the following without using a calculator:
   $$2\log\sqrt{1800} - \frac{1}{2}\log 81 - \frac{1}{3}\log 8$$

5. A Ferris wheel has a diameter of 100 meters and riders get on it from a platform that is 2 meters above the ground. It takes 10 minutes for the Ferris wheel to make one full revolution.
   a. Sketch a graph of the height of a rider above the ground t minutes after the rider boards the Ferris wheel.
   b. Find a formula for the height of a rider above the ground t minutes after the rider boards the Ferris wheel.
   c. Once the rider reaches a height of 27 meters, the rider can see the ocean. For how many minutes can the rider see the ocean during each revolution?