Group #: ________ Name: ______________________________

1. (18 points, 6 points each) Use a calculator (the one you will be using on exams) to evaluate the following. Be mindful of the order of operations! Round your answers to three decimals.

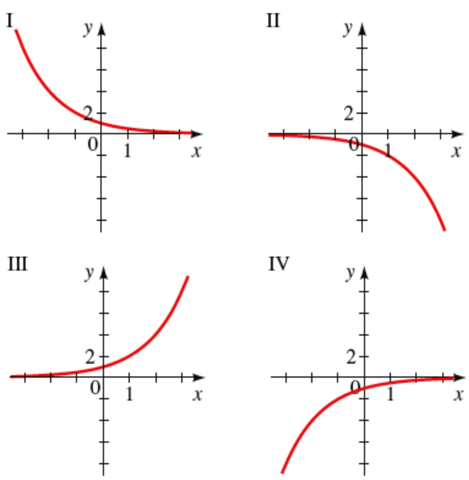
   (a) Find $g(-\frac{5}{4})$ if $g(x) = 2^{x-1.75}$

   (b) Find $h(-\sqrt{2})$ if $h(x) = \frac{1}{3^{2x}}$

   (c) Find $k(-0.95)$ if $k(x) = 165e^{2x} + 3$

2. (12 points) Match the following exponential functions with one of the graphs labeled I, II, III, and IV, show below without using a graphing device.

(a) $f(x) = 2^x$	(b) $f(x) = 2^{-x}$	(c) $f(x) = -2^x$	(d) $f(x) = -2^{-x}$



3. (12 points) **Graph** $f_1(x) = (2)^x$ and $f_2(x) = \left(\frac{1}{2}\right)^x$ on the same set of axes. Please mark your axes clearly including the scale of each tick mark and the x- and y-intercepts (if any).

4. (15 points) A grey squirrel population was introduced in a certain county of Great Britain 30 years ago. Biologists observe that the population doubles every 6 years, and now the population is 100,000.

   (a) What was the initial size of the squirrel population?

   (b) Estimate the squirrel population 10 years from now.

   (c) How many years from now will the squirrel population become 200,000?

5. (15 points) The half-life of cesium-137 is 30 years. Suppose we have a 10-g sample.

   (a) Find a function $m(t) = m_0 2^{-t/h}$ that models the mass remaining after t years.

   (b) How much of the same will remain after 80 years?

   (c) After how many years will only 2 grams of the same remain?

6. (12 points) If 250mg of a radioactive element decays to 200 mg in 48 hours, find the half-life of the element.

7. (16 points, 4 points each) Animal populations are not capable of unrestricted growth because of limited habitat and food supplies. Under such conditions the population follows a *logistic growth model*:

$$P(t) = \frac{d}{1 + ke^{-ct}}$$

where c, d, and k are positive constants. For a certain fish population in a small pond $d = 1200$, $k = 11$, $c = 0.2$, and t is measured in years. The fish were introduced into the pond at time $t = 0$.

(a) How many fish were originally put in the pond?

(b) Find the population after 10, 20, and 30 years.

(c) According to the model, what size does the fish population seem to approach as time goes on? How do you know? (i.e., what is the end behavior of P as $t \to \infty$? In other words, what is the horizontal asymptote of $P(t)$?)

(d) How long does it take for the population to reach 900?