This quiz is due Wednesday, Nov. 17 at the beginning class. Show your work and place your answers in the blanks provided to receive credit.

1. Select the equation which best matches the following graph:
   - a. \( y = -a^{-x}, a > 1 \)
   - b. \( y = a^{-x}, a > 1 \)
   - c. \( y = -\left(\frac{1}{a}\right)^x, 0 < a < 1 \)
   - d. \( y = -\left(\frac{1}{a}\right)^{-x}, 0 < a < 1 \)

   ans. _____ c ____________

2. Solve for \( x \):
   \[ \log_5 x + \log_5(x - 4) = 1 \]
   Using the laws of logs to combine the log terms, we obtain
   \[ \log_5(x(x - 4)) = 1 \]
   Writing the log statement in exponential form,
   \[ x(x - 4) = 5^1 \]
   Expanding and solving:
   \[ x^2 - 4x = 5 \]
   \[ x^2 - 4x - 5 = 0 \]
   \[ (x - 5)(x + 1) = 0 \]
   \[ x = 5 \quad \text{or} \quad x = -1 \]
   Since \( \log_5(-1) \) is not defined, there is only one valid solution: \( x = 5 \).

   ans. _______________________________

3. Solve for \( x \):
   \[ 3^{(4-x)} = \frac{1}{9} \]
   Both sides of the equation can be written as an exponential expression with the same base: \( 3 \).
   \[ 3^{(4-x)} = 3^{-2} \]
   Setting the exponents equal gives:
   \[ 4 - x = -2 \quad \Rightarrow \quad 4 + 2 = x \quad \Rightarrow \quad x = 6. \]

   ans. _______________________________
4. A certain radioactive substance decays according to $A(t) = A_0 e^{-0.0153t}$, where $A_0$ is the initial amount present and $A(t)$ is the amount present at time $t$ (in years). What is the half-life of this substance?

The half-life can be found by solving the following equation:

$$\frac{1}{2} A_0 = A_0 e^{-0.0153t}$$

Dividing both sides by $A_0$ gives:

$$\frac{1}{2} = e^{-0.0153t}$$

To solve for an unknown in the exponent, take the natural log of each side of the equation:

$$\ln \left( \frac{1}{2} \right) = -0.0153t \quad \Rightarrow \quad -\frac{\ln \left( \frac{1}{2} \right)}{0.0153} = t.$$ 

(Please note that since $-\ln \left( \frac{1}{2} \right) = \ln 2$, an equivalent possible correct answer is $\frac{\ln 2}{0.0153} = t$.)

a. $\frac{\ln \left( \frac{1}{2} \right)}{0.0153}$ 
   b. $-\frac{\ln \left( \frac{1}{2} \right)}{0.0153}$ 
   c. $\frac{1 - \ln \left( \frac{1}{2} \right)}{0.0153}$ 
   d. $-\frac{1}{0.0153 \ln \left( \frac{1}{2} \right)}$

ans. ______ b________

5. Write the equation of a parabola with vertex at (0,1) and which contains the point (-1, 2).

I goofed - I intended to include a sketch indicating the direction which the parabola opened. Since I did not, there are two possibilities:

if the parabola opens LEFT, a correct equation is:

$$x = -(y - 1)^2.$$ 

if the parabola opens UP, a correct equation is: $y = x^2 + 1$.

The egrade problem, topic [9.2.2b], (if it is on the exam) will include a sketch of the graph which shows:

the exact coordinates of the vertex, 
the exact coordinates of a second point on the parabola, and 
the direction which the parabola opens (UP, DOWN, RIGHT or LEFT.)

There will be only ONE correct answer choice.