Test 4 Review Sheet.

These are questions from some of my previous test's.

➢ Solving Equations

1. $x^2-10(x-1)=5x(x-2)$
2. $x^2-2x+10=0$
3. $x^2+5(x+1)=5$
4. $2x^2+7x+3=0$
5. $8^{x+1}=2^x$
6. $3^{x+1}=5$
7. $25^{x+1}=125^x$
8. $5\cdot e^{x+1}=21$
9. $\log_6 x+\log_6(x+5)=2$
10. $\log_5 x+\log_5(4x-1)=1$

11. Solve $x^2+6x-7=0$ by completing the square. (No points given for any other method.)

➢ Graphing

1. Graph the parabola given by $y=(x-2)^2+1$. Label x and y intercepts (if any).

2. Graph the parabola, $y=x^2+6x-7$, using any method. Label the vertex and all intercepts on your graph. Give exact values for the x-intercepts.

3. Graph $y=-x^2+4x+10$ by putting the equation in the standard form of the parabola, $y=a(x-h)^2+k$. Label the vertex and all intercepts on your graph. Give exact values for the x-intercepts. (Don't use $x=-\frac{b}{2a}$ to find the vertex unless you want to verify the vertex you got from $y=a(x-h)^2+k$.)

4. Quickly sketch the following functions. Use separate axes for each graph.. Label x and y intercepts (if any).

   a. $y=3^x$ b. $f(x)=\log x$ c. $y=e^{-x}$ d. $f(x)=\left(\frac{5}{7}\right)^x$ e. $y=\left(\frac{7}{5}\right)^x$

5. Quickly sketch the following functions. Use separate axes for each graph. Next to each graph state the Domain and Range. Label x and y intercepts (if any).

   a. $y=(0.12)^x$ b. $f(x)=\ln x$ c. $y=e^{-x}$ d. $f(x)=5^x$ e. $y=\log_4 x$

➢ Applications of Exponential Growth/Decay

1. If \$1000 is invested in an account paying 7.2% interest, compounded quarterly, how long until you have \$5000. (The compound interest models are $A = P(1+\frac{r}{n})^{nt}$ and $A = Pe^{rt}$.)

2. You invest \$1000 in an account paying 15.6% annual interest compounded continuously. How long until your money doubles?

3. In 1970 the United States had a population of 208 million. By 1980 the U.S. population had increased to 225 million. Use this information to . . .

a. Find the exponential growth model, $A = A_0 e^{kt}$, that would predict the U.S. population t years after 1970.
b. According to your model, what will the population in the United States be in the year 2010?

4. The initial population of bacteria in an experiment is 500. 2 hours later the pop has doubled to 1000.
   a. Derive an equation that will predict the population of the bacteria at time t. (Use the exponential growth model $y = Ae^{kt}$)
   b. Find the number of bacteria in the experiment after 12 hours.
   c. How long until the number of bacteria to grows to 1,000,000?

5. Recall the exponential decay model for carbon-14 is $A = A_0 e^{-0.000121t}$. Prehistoric cave paintings were discovered in a cave in France. The paint contained 15% of the original carbon-14. Estimate the age of the paintings.

6. Strontium-90 decays exponentially with a half-life of 28 years.
   a. Use this information to find the decay model for Strontium-90. (The exponential growth/decay model is $A = A_0 e^{kt}$; you need to find k.)
   b. If you start with an initial amount of 200 grams of Strontium-90, use the model you derived in part a. to tell how much Strontium-90 will remain after 100 years.

7. The percentage of math that Fred retains x weeks after being taught math is described by the memory model $f(x) = 80e^{-0.5x} + 20$.
   a. What percentage of math has Fred retained 3 weeks after being taught? (Round answer to nearest whole percent.)
   b. How many weeks until Fred only remembers 21% of the math? (Round answer to nearest whole week.)

➢ Applications of Quadratic Models

1. A Ball is thrown off the top of an 80-foot building. The ball's height, $h(t)$ in feet, above the ground after t seconds is given by the quadratic model $h(t) = -16t^2 + 20t + 80$.
   a. Find the ball's height after 1 second
   b. What is the ball's maximum height, how many seconds to reach that height?
   c. When does the ball hit the ground?

2. Jocko throws a ball from the top of a 64-foot tall building with an upward velocity of 48 ft/sec. The height of the ball above the ground can be modeled by the quadratic function $h(t) = -16t^2 + 48t + 64$. (t in seconds, $h(t)$ in feet.)
   a. Find and interpret $h(1)$.
   b. How long until the ball reaches its maximum height? What is that maximum height?

3. The function $P(I) = -5I^2 + 80I$ describes the power, $P(I)$ given in volts, of a generator subject to I Amps of electricity.
   a. Find and interpret $P(2)$.
   b. Graph the function. Clearly label the vertex of the parabola, and clearly label all the intercepts.

c. How many Amps produces the maximum power? What is the maximum power?
d. How many Amps yield zero power?

4. The function $P(x) = -2x^2 + 20x + 20$ models the percentage, $P(x)$, of people who like a political candidate who smiles x times in a one-minute ad.
   a. Find and interpret $P(0)$.
   b. How many smiles would produce the greatest likeability?

➢ Concept Questions

1. What is the decimal approx. for $\log 53$? Explain why $\log 53$ is between 1 and 2.

2. What is the decimal approx. for $\log 7$? Explain why $\log 7$ is between 0 and 1.

3. If $f(g(x)) = x$, then what does this suggest about the functions f and g?

➢ Quadratic and Rational Inequalities:

1. Solve $x^2 - x - 2 \le 0$. (You can use any notation for the solution set,.)

2. Find the domain of $f(x) = \log(x^2 - 5x + 6)$.

3. Find the domain of $f(x) = \ln\left(\dfrac{4-x}{x+2}\right)$

➢ Working with Logarithms

1. Evaluate a. $\log_3 9$ b. $\log_{25} 5$ c. $\log_3 3^x$ d. $\log_2\left(\frac{1}{8}\right)$
2. Expand the following logarithmic expression as much as possible: $\log_2\left(\dfrac{xy^2}{16}\right)$
3. Expand: $\log\sqrt{\frac{s^2t}{v^2}}$
4. Combine into a single log: $2\ln x + \ln(x-1) - 3\ln y$

➢ Composition of Functions and Inverses of Functions

1. If $f(x) = \frac{x-2}{x}$ & $g(x) = \frac{-2}{x-1}$. Find $(f \circ g)(x)$. What does your answer suggest about f and g?

2. If $f(x) = \frac{x+1}{x-2}$ & $g(x) = \frac{2x+1}{x-1}$, find $(f \circ g)(x)$. What does your answer suggest about f and g?

3. If, $f(x) = 2x - 8$ find $f^{-1}(x)$.

4. If, $f(x) = \dfrac{x}{x+1}$ find $f^{-1}(x)$.