Math 1 Practice Problems II

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Last updated July 20, 2018

1. Write the following in transformation form. Is there a max/min? What is it? Solve for the x-intercepts using the transformation form.

   (a) $f(x) = x^2 - 8x + 13$ (b) $f(x) = -3x^2 + 12x - 6$

2. Suppose an object thrown straight upward is modeled by the function $h(t) = -16t^2 + 40t$.

   (a) When does the ball reach a height of 24 ft?
   (b) When does the ball reach a height of 48 ft?
   (c) What is the greatest height reached by the ball?
   (d) When does the ball reach the highest point of its path?
   (e) When does the ball hit the ground?

3. For each of the following polynomials, find the zeros and their multiplicities, then sketch the graph.

   (a) $f(x) = x^3 + x^2 - x - 1$ (c) $x^4 - 3x^2 - 4$
   (b) $f(x) = \frac{1}{8}(2x^4 + 3x^3 - 16x - 24)^2$ (d) $(x-1)^2(x+2)^3$

4. For each of the following rational functions, find the vertical, horizontal, and slant asymptotes (if any), the x- and y-intercepts, then plot the graph.

   (a) $f(x) = \dfrac{x^2 - 2x + 1}{x^3 - 3x^2}$ (b) $f(x) = \dfrac{3x - x^2}{2x - 2}$ (c) $f(x) = \dfrac{2x(x+2)}{(x-1)(x-4)}$

5. Graph the following using transformations.

   (a) $f(x) = e^{x-3} + 4$ (c) $f(x) = \log_3(-x) + 2$
   (b) $f(x) = -(\frac{1}{5})^x$ (d) $f(x) = -\ln(x-2)$

6. Find the domain of $\ln(x - x^2)$.

7. Expand:

   (a) $\ln\left(\dfrac{x^3\sqrt{x-1}}{3x+4}\right)$ (b) $\log\sqrt{x\sqrt{y\sqrt{z}}}$

8. Write as a single log term:

$$\frac{1}{3}\log(2x+1) + \frac{1}{2}\left[\log(x-4) - 3\log(x^4 - x^2 - 1)\right]$$

9. Evaluate:

   (a) $\ln(\ln e^{e^{200}})$

   (b) $\log_2 6 - \log_2 15 + \log_2 20$

10. Solve for x:

    (a) $\log_5 x = 2$

    (b) $\log_x 25 = 2$

    (c) $e^{4-x} = 2$

    (d) $3^{x+2} = 7$

    (e) $\log_2(x+2) = 5$

    (f) $4 + 3\log(2x) = 16$

    (g) $x^2 2^x - 2^x = 0$

    (h) $e^{2x} - 3e^x + 2 = 0$

    (i) $2\log x = \log 2 + \log(3x - 4)$

    (j) $2^{2/\log_5 x} = \frac{1}{16}$

    (k) $2^{3x+1} = 3^{x-2}$

11. Suppose \$1000 is invested into an account.

    (a) Find the amount after 3 years if the account has an interest rate of 2% per year and is compounded annually, quarterly, monthly, weekly, and continuously. Which earns the most money?

    (b) If the interest rate is 2% per year, how long does it take the investment to double if it is compounded continuously?

    (c) What interest rate is needed to double the investment in 10 years if compounded continuously?

12. Polonium-120 has a half life of 140 days. Suppose the sample of this substance has a mass of 300 mg.

    (a) Find a function that models the amount of the sample remaining at time t.

    (b) Find the mass remaining after one year.

    (c) How long does it take to decay to a mass of 200 mg?

13. A culture starts with 8,600 bacteria. After one year, the count is 10,000.

    (a) Find a function that models the number of bacteria after t hours.

    (b) Find the number of bacteria after 2 hours.

    (c) After how many hours will the number of bacteria double?

14. A cup of coffee has temp 200°F and is placed in a room that has temperature 70°F. After 10 minutes the cup of coffee is 150°F.

    (a) Find a function that models the temperature of the coffee at time t.

    (b) Find the temperature of the coffee after 15 minutes.

    (c) When will the coffee have cooled to 100°F?