BLC 190

Worksheet 9

Name:_____

1. Solve the following equations:

   (a) $3(2x-5) - (3x-9) = 3$

   (b) $3 = \dfrac{5-2x}{3+4x}$

   (c) $5 \cdot 3^{2t} = 4$

   (d) $\log_3(x+1) = 2$

   (e) $\dfrac{2x+3}{5} + 3 = 4x$

   (f) $x^4 = 7x^2 - 12$

   (g) $5e^{3t} - 4 = 2e^{3t} + 1$

   (h) $\ln(4+2e^x) = 3$

2. Solve the following equation for y:

$$3xy - 2x \;=\; 5y + 7x + 3$$

3. Solve the following equation for y:

$$x \;=\; \frac{e^y}{1 + 2e^y}$$

4. Solve the following equation:

$$\frac{3}{x+2} \;-\; \frac{5}{x-3} = 0$$

5. Rationalize the denominator of the following fractions:

   (a) $\dfrac{3}{\sqrt{x}-5}$

   (b) $\dfrac{x+4}{\sqrt{x}+\sqrt{y}}$

6. Suppose that $f(x) = \sin(x^2)$ and $g(x) = e^x$.

   (a) What is $f(g(x))$?

   (b) What is $g(f(x))$?

7. Find all solutions to the following equations. Give the exact answers in radians.

(a) $3\csc\theta + 7 = 1$

(b) $\cos\theta + \sin\theta = 0$

(c) $\sec^2\theta - 3\sec\theta + 2 = 0$

8. A meteorologist is using a weather balloon to measure the air temperature at high altitudes. At the time of the measurement, the air temperature at sea level was approximately 24°C, and the air temperature at an altitude of 4.0 km was approximately −3°C. Assume that the air temperature is linearly related to altitude.

   (a) Find a linear formula for the air temperature at an altitude of x kilometers.

   (b) What is the air temperature at an altitude of 2.3 km?

   (c) At what altitude will the air temperature be −13°?

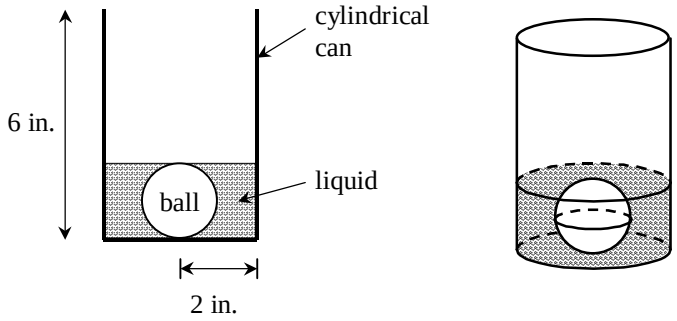
9. At noon a bacteria culture contains 200 bacteria. Five hours later, the culture contains 3000 bacteria. Assume that the number of bacteria continues growing exponentially at the same rate.

   (a) Find a formula for the number of bacteria after t hours.

   (b) How many bacteria will there be at 7:45 pm?

   (c) At what time will there be 5 million bacteria? (Give your answer as a time, e.g. 12:37am.)

10. A heavy metal ball is placed into a tin can, and then liquid is added until the top of the ball is just barely covered:



The can is a cylinder 6 inches high, with a radius of 2 inches, and the ball is a sphere of radius R.

(a) Find a formula for the volume of liquid in the can as a function of R. (*Hint:* The volume of a cylinder with height h and radius r is $V = \pi r^2 h$, and the volume of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.)

(b) Sketch a graph of the volume of the liquid as a function of R (from (a)).