

Math Review

Functions and data tables

1. Make a data table showing the values of x and y for the following functions, for each integer value of x from -3 to $+3$. (Hint: if necessary, start by algebraically manipulating the equation into a form that allows you to easily find the value of y). What are the slopes and y -intercepts of equations (a) and (b)? What type of function is equation (c)?
 - a. $y = 3x$
 - b. $2x + 3y = 6$
 - c. $y + 3 = x^2$

Graphing

2. Graph the functions from Problem 1. You may use the same set of axes to plot all three functions. Label the x and y axes, and show the x and y scale that you have chosen. (You can use graph paper, or just draw the graph on plain paper that you have drawn axes and hatch marks to show the scale).

Geometrical areas and volumes

3. Calculate the following:
 - a. The area of a square 5.0 feet on a side.
 - b. The circumference and area of a circle with a radius of 7.00 km.
 - c. The area of a triangle with a height of 30 m and a base of 5.0 m.
 - d. The surface area and volume of cube 3.0 inches on each edge.
 - e. The radius and volume of a sphere with a *circumference* of 31.2 cm.

Exponential and logarithm functions

4. Simplify the following expressions completely using the laws of exponents.
 - a. $3^x \cdot 3^{-x}$
 - b. $(4^x)^y$
 - c. $3^3 \div 3^5$
 - d. $e^a \cdot e^b \div e^c$
 - e. $10^{bx} \cdot 10^{-cx}$

5. Simplify the following expressions completely using the properties of logarithms. (Note: “log x” written without a subscript is shorthand for $\log_{10} x$, “ln” written without a subscript is short for $\log_e x$.)
 - a. $\log (m/n)$
 - b. $\log (m \cdot n)$
 - c. $\log m^n$
 - d. $\ln e^{-n}$
 - e. $\log_e (m \cdot n)$

6. Evaluate the following without using a calculator. (Hint: $\log 2 \approx 0.30$, $\log 3 \approx 0.48$, $\log 7 \approx 0.85$, $\ln 2 \approx 0.69$, $\ln 10 \approx 2.3$)
 - a. $\log_3 27 =$
 - b. $\log_8 2 =$
 - c. $\log 6 =$
 - d. $\log 700 =$
 - e. $\log 3,000 =$
 - f. $\ln 8 =$
 - g. $\ln 0.1 =$

7. What is the doubling time (or halving time) if the exponential growth (or decay) rate is the following:
 - a. 3.2% per year
 - b. 0.45/s
 - c. 0.0038/min

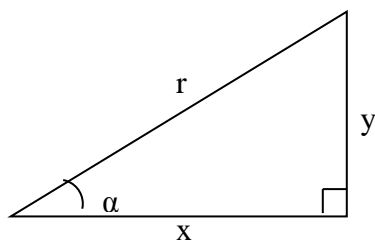
8. A population of Canadian Geese grows exponentially at a rate of 10% per year.
 - a. In about how many years will the population double?
 - b. In about how many years will the population have doubled 20 times?
 - c. About how many times the original population will the geese population be after 20 doublings? (Hint: Use the fact that $2^{10} = 1024 \approx 10^3$ to calculate the population).

Trigonometry

9. Convert the following angles from degrees to radians and vice versa:

- a. 180°
- b. 270°
- c. $4\pi/3$
- d. $-\pi$

10. For the right triangle below, write the formulas for $\sin \alpha$, $\cos \alpha$, and $\tan \alpha$ in terms of the lengths of the sides x , y , and r .



11. Write the formula for $\tan \alpha$ in terms of $\sin \alpha$ and $\cos \alpha$.

12. If angle α equals 60° and side r has a length of 5.00 miles, what are the lengths of sides x and y , respectively? [Hint: $\cos 30^\circ = 0.500$, $\sin 60^\circ = 0.866$.] Check your answer using the Pythagorean Theorem.