

# Exponentials

## Problem Set 8

1. Evaluate

(a)  $\frac{5^2 \cdot 8^{\frac{1}{3}}}{5^{-4} \cdot 2^7}$

(b)  $\frac{3^2 \cdot 4^{-2} \cdot 5}{2^{-4} \cdot 3^3 \cdot 25}$

2. Simplify

(a)  $\frac{(3x^2)(4x^5)}{x^{\frac{1}{2}}}$

(c)  $(5x^2)^3 \left(\frac{x^4}{25}\right)^{\frac{1}{2}}$

(b)  $(4x^{\frac{1}{2}}y^{-1})^{\frac{7}{2}}$

(d)  $\left(\frac{2x^{\frac{3}{4}}}{y^{\frac{1}{3}}}\right)^3 \div \left(\frac{16}{y^4}\right)^{\frac{1}{2}}$

3. Simplify

(a)  $2^{3x} \times \frac{2^{x-1}}{3^x}$

(c)  $9^{\frac{x}{2}} \times 27^{\frac{x}{3}}$

(b)  $16^x \times 2^{5x}$

(d)  $32^{x+2} \div 8^{2x-1}$

4. Solve

(a)  $9^x = 3^{x-1}$

(b)  $8^x \times 2^x = 4^{4-2x}$

(c)  $25 \times 5^x = \left(\frac{1}{5}\right)^x \times \frac{1}{125}$

5. Find the equation of the exponential which has a y-intercept of 3 and passes through the point (2,15).

6. Find the equation of the exponential which goes through the point (1,4.8) and has a doubling time of 3 seconds.

7. The equation of bacteria in a culture is given by the formula  $Q(t) = 250 \cdot 3^{\frac{t}{4}}$  where  $t$  is measured in days. Estimate

(a) the initial population.

(b) the population after 4 days.

(c) the population after 14 days.

8. Find the equation of the exponential of the form  $y = ab^x$  which goes through the points  $(-3, \frac{1}{2})$  and  $(2,5)$ .

9. Sketch the following exponential functions.

(a)  $f(x) = e^x + 1$

(c)  $f(x) = -e^x$

(e)  $f(x) = e^{2x}$

(g)  $f(x) = e^{x-1}$

(b)  $f(x) = e^x - 1$

(d)  $f(x) = e^{-x}$

(f)  $f(x) = 2e^x$

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

10. Consider the function  $f(x) = 7e^{-3x}$ .

(a) Evaluate  $f(0.5)$ .

(b) What is the y-intercept of this function?

(c) Sketch the graph of this function.

(d) What happens to  $f(x)$  as  $x$  gets larger?

11. The number of bacteria in a population, given by the formula  $N(t) = N_0e^{0.12t}$ , has an initial population of 240000. How many bacteria will be present after 5 hours?

12. The demand  $D$  for a specific product in items per month is given by  $D(x) = 880e^{-0.18x}$ , where  $x$  is the price in dollars of the product.

(a) What will be the monthly demand when the price is \$10?

(b) What will be the monthly demand when the price is \$18?

(c) What will happen to the demand as the price increases without bound?