

## Exponential Functions Practice Questions

### Laws of Exponents

1) Write each of the following expressions as a single exponent with the same base.

- a)  $2^3 \cdot 2^6$       b)  $(9^4)^2$       c)  $3^0 \cdot 3^1 \cdot 3^5$       d)  $(4^4)^{\frac{1}{2}}$
- e)  $\left(\frac{1}{4^3}\right)^8$       f)  $\left(\frac{3^5}{3^2}\right)^{-7}$       g)  $6^5 \cdot 6^{-5}$       h)  $12\left(\frac{12^{-2}}{12}\right)^3$

2) Write each of the following algebraic expressions in the form of a single exponent with the same base.

- a)  $a^2 \cdot a^5$       b)  $a(a^3)^2$       c)  $2^a \cdot 2^{2a}$       d)  $\frac{a^5}{a^7}$
- e)  $3^a \cdot 3^4$       f)  $a^b \cdot a^{b+1}$       g)  $a\left(\frac{a^2}{a^0}\right)$       h)  $a^7 \cdot a^{-7}$

3) For each of the following, find the value or values of x

- a)  $3^x = 27$       b)  $x^2 = 36$       c)  $2^5 = x$
- d)  $x^3 = 64$       e)  $2^x = 16$       f)  $7^4 = x$

4) Re-write each of the following using exponents

a)

$$\sqrt{3}$$

b)

$$\sqrt[3]{9}$$

c)

$$\sqrt[5]{5^2}$$

d)

$$\sqrt{\frac{2^3}{3^3}}$$

e)

$$\sqrt{5} \cdot \sqrt[3]{5^{-2}}$$

f)

$$\left(\frac{\sqrt[4]{8}}{\sqrt{8}}\right)^{-1}$$

5) Simplify the following expressions

a)

$$(\sqrt[3]{a})^3$$

b)

$$b^8 \div b^2$$

c)

$$\frac{12 \cdot \sqrt{3e} \cdot (4e)^{1/2}}{(-12e)^2}$$

d)

$$2c^{1/3} \cdot 4\sqrt[3]{c}$$

e)

$$\frac{4^{2d}}{2^{4d}}$$

6) For each case, find the value of x

a)

$$7^2 \cdot 7^3 = 7^x$$

b)

$$13^{-5} \cdot 13 = 13^x$$

c)

$$4^x \cdot 4^2 = 4^8$$

d)

$$(5^x)^2 = 5^{1/2}$$

e)

$$\left(\frac{2}{3}\right)^x \cdot \left(\frac{2}{3}\right)^4 = \left(\frac{2}{3}\right)^{-5}$$

f)

$$(2^4)^x = \frac{1}{2}$$

## Exponential Functions: Basics and Sketching

7) Indicate which of the following situations calls for an exponential model

- a) A city's population increases by 2.8% every year
- b) Filling a pool using a water source with a constant flow
- c) A bacteria's population triples every 30 minutes
- d) The value of an investment earning 1.2% interest every year

8) Complete the following table below

Rule	Domain	Range	Initial Value	Variation	Asymptote
$f(x) = 3\left(\frac{1}{5}\right)^x$					
$g(x) = 2.5^x$					
$h(x) = 3(5)^{x-3} + 1$					
$i(x) = 4(0.3)^{x-4} + 2$					
$j(x) = 2.5(1.01)^{12x}$					
$k(x) = 1000(0.95)^{x/6}$					

9) For each case, indicate whether the function is increasing or decreasing

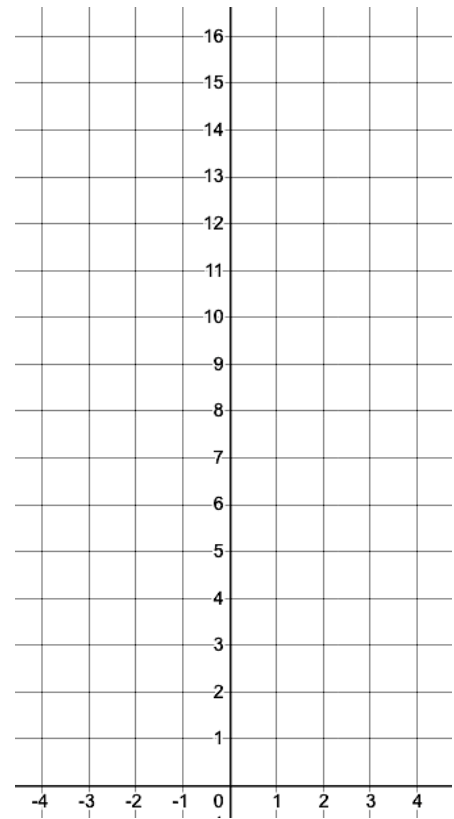
- a)  $f(x) = 2(0.2)^x$
- b)  $f(x) = 0.5(3)^{x-4}$
- c)  $f(x) = 38\left(\frac{1}{5}\right)^{3-x} + 1$
- d)  $f(x) = -7(0.3)^x$

10) Sketch each of the functions below

a)  $f(x) = 0.5^x$

b)  $g(x) = 3^x$

c)  $h(x) = 5^x$



11) For each of the following rules, determine

- a) Whether it represents growth or decay
- b) The domain and range
- c) The y-intercept
- d)  $f(1)$  and  $f(-1)$
- e) The equation of the asymptote

a)  $f(x) = 0.25^x$

b)  $g(x) = \left(\frac{1}{2}\right)^x$

c)  $h(x) = 0.9^x$

d)  $i(x) = 1.5^x$

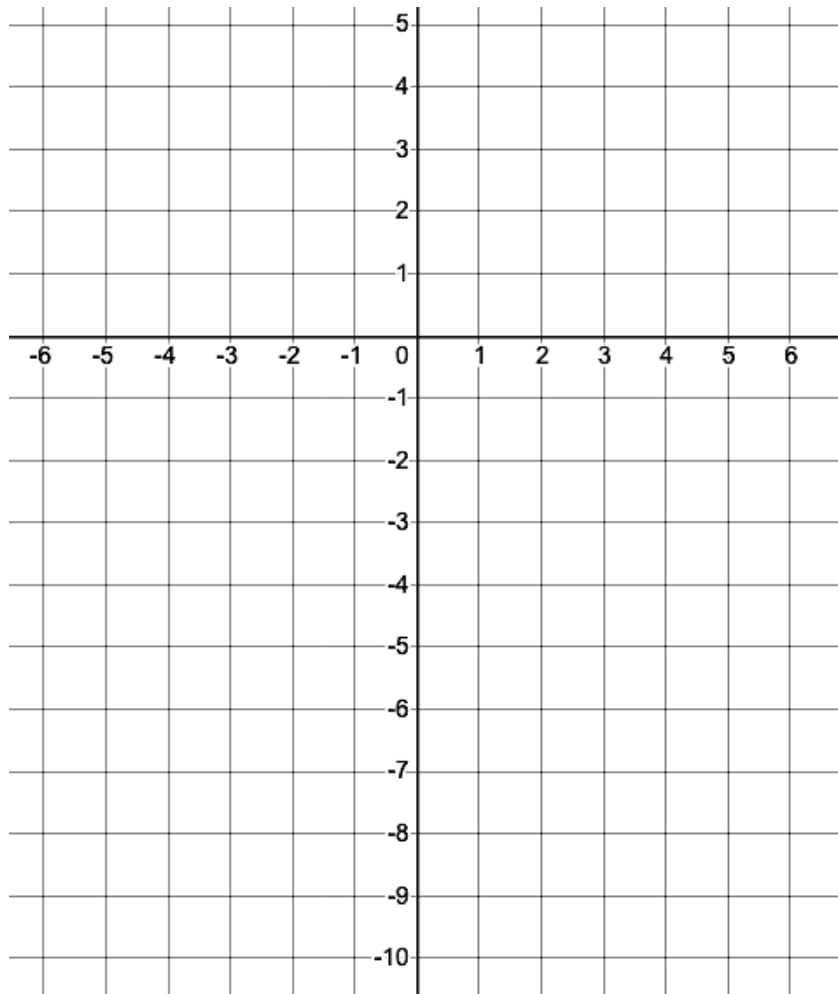
e)  $j(x) = 4^x$

12) Sketch the following functions

a)  $f(x) = -(6)^{2(x-1)} + 1$

b)  $g(x) = -2\left(\frac{1}{3}\right)^{-3x+12} - 5$

c)  $h(x) = 0.25(0.5)^{2x+8}$



**Exponential Functions: Finding the Rule from Words**

13) An individual invests \$5 400 in a guaranteed investment certificate with an annual interest rate of 3.6%.

14) The value of an investment is expected to increase by 0.5% every 4 months on a \$500 initial investment.

15) Each year, the frog population of a small wooded area decreases by 5%. The wooded area currently has 2000 frogs.

**Exponential Functions: Finding the Rule from Points**

16) Determine the rule of the exponential function in the form  $f(x) = y = ac^x$  given that it passes through the two points given.

a)  $(1, 24)$  and  $(4, 5184)$

b)  $(2, 10.125)$  and  $(-1, 2)$

c)  $(4, -81)$  and  $(7, -2187)$

d)  $(-3, 16)$  and  $(2, 0.5)$

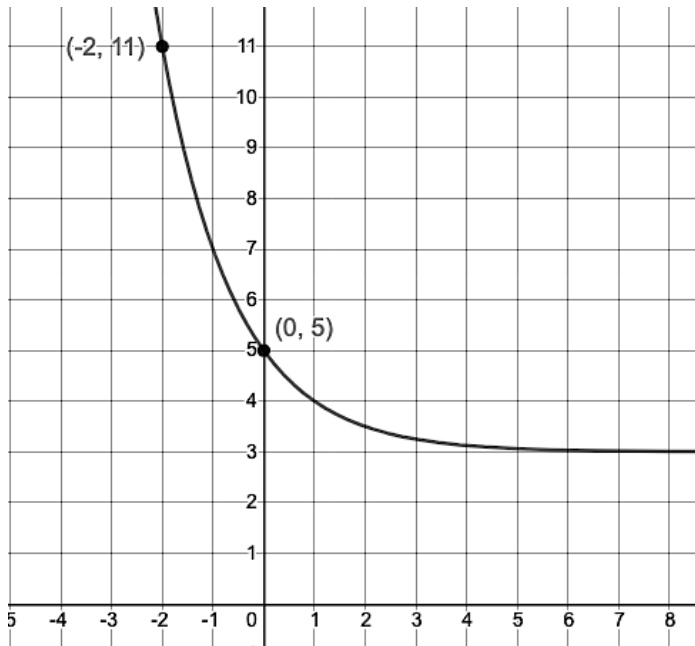
17) Determine the rule of an exponential function passing through the points  $(0, 4)$  and  $(1, 8)$  with an asymptote at  $y = 2$

18) Determine the rule of an exponential function passing through the points  $(1, 3)$  and  $(0, 23)$  with an asymptote at  $y = -2$

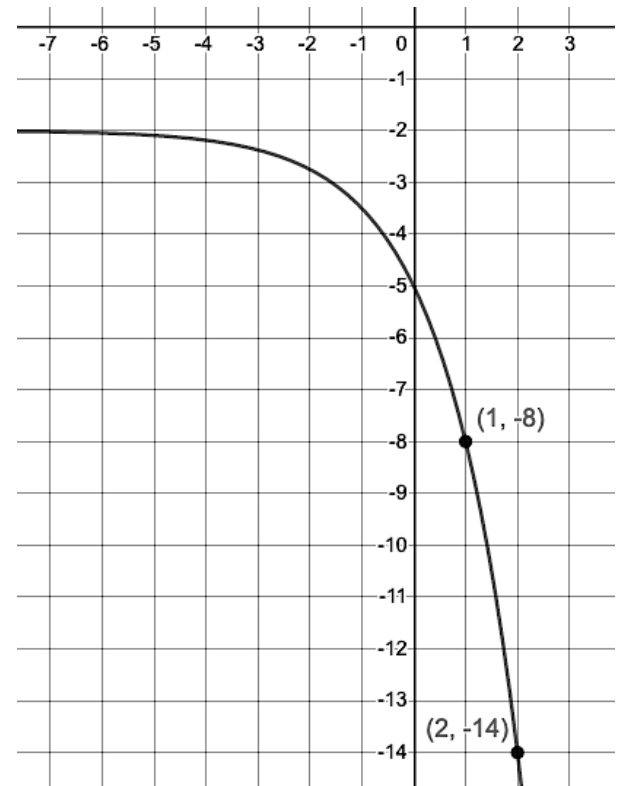
19) Determine the rule of an exponential function passing through the points  $(0, -24)$  and  $(1, -4)$  with an asymptote at  $y = 1$

20) Determine the rule of the functions shown in the graphs below.

a)



b)





## Exponential Functions: Solving Equalities

21) Find the zeros of the functions given below

a)

$$f(x) = 3(2)^{x-3} - 96$$

b)

$$g(x) = 10 - 15\left(\frac{2}{3}\right)^{x-2}$$

c)

$$h(x) = 7.5(6)^x + 6$$

d)

$$i(x) = 0.2(0.85)^{x-5} - 0.2$$

22) Solve each of the following equations algebraically

a)

$$5^{6-x} = 25^{2x-13}$$

b)

$$\left(\frac{1}{2}\right)^x = 4^{10}$$

c)

$$\sqrt{2}^{x+1} = 8^{-3x}$$

### Exponential Functions: Solving Inequalities

23) Given functions  $f$  and  $g$ , where  $f(x) = 2(3^{-2x} - 5)$  and  $g(x) = 2\left(\frac{1}{9}\right)^{4x} - 10$   
Determine the values for which:

a)  $f(x) = g(x)$

b)  $f(x) > g(x)$

c)  $f(x) < g(x)$

24) Solve the following inequalities

a)

$$25^x > 1025$$

b)

$$2^{x+1} > 256$$

c)

$$7^{x-2} \leq 2401$$