Name _____ Date _____ Period _____

12.2 We Have Liftoff!-----Properties of Exponential Graphs

Vocabulary

1. Explain how the natural base e is similar to and different from π.

Both are symbols that represent irrational numbers and are constants that are used to simplify calculations. The natural base e represents continuous growth and is used to model population changes, radioactive decay of a substance, and other physics and calculus applications. It is approximately equal to 2.71828. The number π represents the ratio of a circle's circumference to its diameter and is used in many geometry formulas for area and volume of geometric shapes. It is approximately equal to 3.14159.

Problem Set

Identify each function as exponential "growth" or "decay." Explain your reasoning.

2. $f(x) = 8^x$ The function represents exponential growth because the base is greater than 1.

3. $f(x) = 0.2^x$ The function represents exponential decay because the base is between 0 and 1.

4. $f(x) = \left(\frac{5}{2}\right)^x$ The function represents exponential growth because the base is greater than 1.

5. $f(x) = 25^x$ The function represents exponential growth because the base is greater than 1.

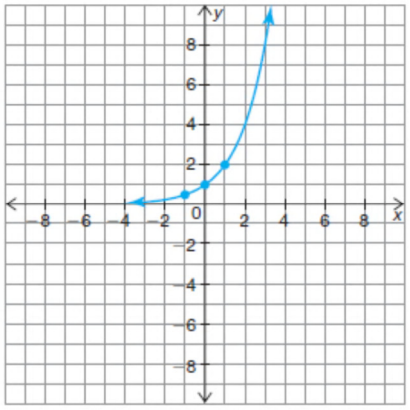
6. $f(x) = \left(\frac{1}{6}\right)^x$ The function represents exponential decay because the base is between 0 and 1.

7. $f(x) = 7.5^x$ The function represents exponential growth because the base is greater than 1.

Complete each table and graph the exponential function.

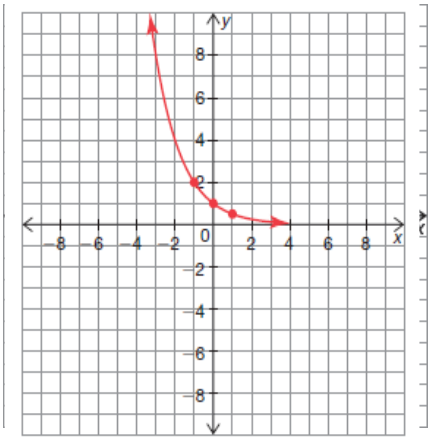
8. $f(x) = 2^x$

x	$f(x)$
-1	$\frac{1}{2}$
0	1
1	2



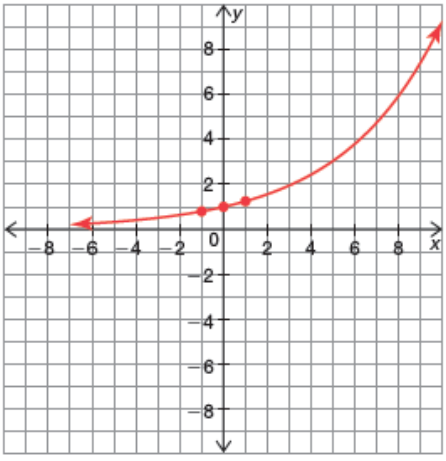
9. $f(x) = \left(\frac{1}{2}\right)^x$

x	$f(x)$
-1	2
0	1
1	$\frac{1}{2}$



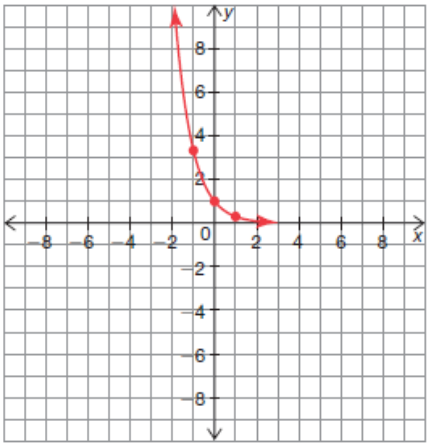
10. $f(x) = \left(\frac{5}{4}\right)^x$

x	$f(x)$
-1	$\frac{4}{5}$
0	1
1	$\frac{5}{4}$



11. $f(x) = 0.3^x$

x	$f(x)$
-1	$\frac{10}{3}$
0	1
1	$\frac{3}{10}$



Write an exponential function with the given characteristics.

12. increasing over $(-\infty, \infty)$

reference point $\left(-1, \frac{1}{9}\right)$

Answers will vary.

$f(x) = 9^x$

13. decreasing over $(-\infty, \infty)$

reference point $\left(1, \frac{2}{3}\right)$

Answers will vary.

$f(x) = \left(\frac{2}{3}\right)^x$

14. increasing over $(-\infty, \infty)$

reference point $\left(-3, \frac{1}{8}\right)$

Answers will vary.

$f(x) = 2^x$

15. End behavior $\lim_{x \to -\infty,} f(x) = \infty$ and $\lim_{x \to \infty,} f(x) = 0$

reference point $\left(-4, \frac{81}{16}\right)$

Answers will vary.

$f(x) = \left(\frac{2}{3}\right)^x$

Use the formula for compound interest to determine the amount of money in each account after interest is accrued.

$$I(t) = P\left(1 + \frac{r}{n}\right)^{rt}$$

16. An investor deposits \$1,000 in an account that promises 5% interest calculated at the end of each year. How much will be in the account after seven years?

There will be \$1,407.10 in the account after seven years.

$A(t) = P\left(1 + \frac{r}{n}\right)^{n \cdot t}$

$A(7) = 1{,}000\left(1 + \frac{0.05}{1}\right)^{1 \cdot 7}$

$= 1{,}000(1.05)^7$

$\approx 1{,}407.10$

17. At the start of the school year, Fairview High School deposits PTA dues in an account that offers 3.5% compound interest at the end of a year. If \$2500 is collected in PTA dues, how much money will the school have at the start of the next school year?

[redacted]

18. Kyle put \$300 of his birthday money in the bank. The bank compounds interest twice a year at 4%. How much money will Kyle have after three years?

[redacted]

19. An investing group has \$50,000 to invest. They put the money in an account that compounds interest monthly at a rate 6%. How much money will the group have at the end of 10 years?

[redacted]

20. Interest is compounded quarterly at Money Bank at a rate of 5.5%. A new client opens an account with \$7200. How much money will be in the account at the end of six years?

[redacted]