

Exponential Function Characteristics and Manipulation (2.3+2.4) Homework

1. Rewrite each of the following in the form $y = a(b)^x$

a. $y = 3^{x+2}$

d. $y = 5^{2x-1}$

b. $y = 5^{-x}$

e. $y = \left(\frac{1}{8}\right)^{\frac{1}{3}x}$

c. $y = 10(4)^{\frac{x}{2}}$

f. $y = 20(6)^{x-2}$

2. Which **one** of the following is equivalent to $f(x) = 9(9)^{3x}$

(A) $f(x) = 3^{6x+1}$

(C) $f(x) = 3^{6x+2}$

(B) $f(x) = 81^{3x}$

(D) $f(x) = 81^{3x+1}$

3. **Select all** of the following that are equivalent to $f(x) = 6(2)^{1-3x}$

(A) $f(x) = (12)^{1-3x}$

(D) $f(x) = 6\left(\frac{1}{2}\right)^{3x-1}$

(B) $f(x) = 6\left(\frac{2}{2^{3x}}\right)$

(E) $f(x) = 12\left(\frac{1}{2}\right)^{3x}$

(C) $f(x) = \frac{12}{8^x}$

(F) $f(x) = 12(2)^{-3x}$

4. **Select all** of the following that are equivalent to $g(x) = 50(25)^{\frac{x}{2}-1}$

(A) $g(x) = 2(25)^{\frac{x}{2}}$

(C) $g(x) = 10(25)^x$

(B) $g(x) = 2(5)^x$

(D) $g(x) = (100)^{\frac{x}{2}}$

5. Evaluate (Without a calculator)

a. $32 \cdot 4^{-\frac{3}{2}}$

d. $\left(4^2 - 16^{\frac{1}{2}}\right)^2$

b. $\frac{\sqrt{5}}{5^{\frac{1}{2}} + 5^{\frac{3}{2}}}$

e. $\left(3^2 \cdot 3^{\frac{1}{2}}\right)^2$

c. $\frac{16^{\frac{3}{4}}}{8^{\frac{3}{3}}}$

f. $\frac{5^4}{\left(\frac{3}{5^2}\right)^{\frac{4}{\sqrt{25}}}}$

6. Let $f(x) = -10(4)^x$. Which one of the following statements describes the end behavior of $f(x)$?

- (A) As the input values of $f(x)$ decrease without bound, the output values increase without bound. As the input values of $f(x)$ increase without bound, the output values get arbitrarily close to 0.
- (B) As the input values of $f(x)$ decrease without bound, the output values decrease without bound. As the input values of $f(x)$ increase without bound, the output values get arbitrarily close to 0.
- (C) As the input values of $f(x)$ decrease without bound, the output values get arbitrarily close to 0. As the input values of $f(x)$ increase without bound, the output values increase without bound.
- (D) As the input values of $f(x)$ decrease without bound, the output values get arbitrarily close to 0. As the input values of $f(x)$ increase without bound, the output values decrease without bound.

7. Let $g(x) = 3\left(\frac{4}{5}\right)^x - 6$. Which one of the following statements describes the end behavior of $g(x)$?
- (A) As the input values of $f(x)$ decrease without bound, the output values increase without bound. As the input values of $f(x)$ increase without bound, the output values get arbitrarily close to 6.
- (B) As the input values of $f(x)$ decrease without bound, the output values decrease without bound. As the input values of $f(x)$ increase without bound, the output values get arbitrarily close to 6.
- (C) As the input values of $f(x)$ decrease without bound, the output values increase without bound. As the input values of $f(x)$ increase without bound, the output values get arbitrarily close to -6 .
- (D) As the input values of $f(x)$ decrease without bound, the output values decrease without bound. As the input values of $f(x)$ increase without bound, the output values get arbitrarily close to -6 .

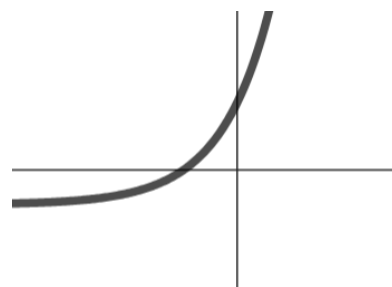
8. Let $h(x)$ be an exponential function with the following end behavior:

$$\lim_{x \rightarrow -\infty} h(x) = 0 \text{ and } \lim_{x \rightarrow \infty} h(x) = -\infty$$

- (A) $h(x) = -3(4)^{-x+1}$
 (B) $h(x) = -2(5)^{x+1}$
 (C) $h(x) = 3(4)^{-x+1}$
 (D) $h(x) = 2(5)^{x+1}$

9. Which one of the following function equations may correspond with the graph shown to the right?

- (A) $y = 3(2)^{x-1}$
 (B) $y = 3(2)^x - 1$
 (C) $y = 3(2)^{x+1}$
 (D) $y = 3(2)^x + 1$



10. For each of the following functions, determine the domain, determine the range, determine the location of all relative maxima and minima, and determine if the function is concave up or concave down.

a. $f(x) = 4(3)^{-x} - 5$

b. $g(x) = -6\left(\frac{1}{2}\right)^{x+1}$

c. $h(x) = 10(8)^{\frac{x}{3}}$

11. I am thinking of a geometric sequence g_n . If $g_5 = 192$ and $g_{10} = 24$, find g_{20} .

12. I am thinking of an exponential function $f(x) = a(b)^x$ with $b > 0$. $f(3) = \frac{5}{8}$ and $f(6) = 40$.

a. Find $f(7)$

b. Find $f(7.5)$

c. (Calculator Allowed) Find the average rate of change of $f(x)$ from $x = 3$ to $x = 6$. Express your answer as a decimal approximation. Show the computations that led to your answer.

d. (Calculator Allowed) If f were linear with $f(3) = \frac{5}{8}$ and $f(6) = 40$, then what would $f(7)$ be?

Exponential Function Characteristics and Manipulation (2.3+2.4) HW Answers

1.

- a. $9(3)^x$
- b. $\left(\frac{1}{5}\right)^x$
- c. $10(2)^x$
- d. $\frac{1}{5}(25)^x$
- e. $\left(\frac{1}{2}\right)^x$
- f. $\frac{5}{9}(6)^x$

2. C

3. B, C, D, E, F

4. A, B

5.

- a. 4
- b. $\frac{1}{6}$
- c. $\frac{1}{2}$
- d. 144
- e. 243
- f. 25

6. D

7. C

8. B

9. B

10.

- | | | | |
|--------------------------------|-----------------------|---------------------|--------------|
| a. Domain: $(-\infty, \infty)$ | Range: $(-5, \infty)$ | No relative extrema | Concave Up |
| b. Domain: $(-\infty, \infty)$ | Range: $(-\infty, 0)$ | No relative extrema | Concave Down |
| c. Domain: $(-\infty, \infty)$ | Range: $(0, \infty)$ | No relative extrema | Concave Up |

11. $\frac{3}{8}$

12.

- a. 160
- b. 320
- c. $\frac{f(6)-f(3)}{6-3} = \frac{40-\frac{5}{8}}{6-3} = 13.125$
- d. If f were linear, it would be a line that passes through (6,40) with slope of 13.125.

$$f(x) = 40 + 13.125(x - 6)$$

$$f(7) = 40 + 13.125(7 - 6)$$

$$f(7) = 53.125$$