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MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

State whether the function is an exponential growth function or exponential decay function, and describe its end behavior using limits.

1) $f(x) = \left(\frac{1}{9}\right)^{-x}$ 1) _____

A) Exponential growth function; $\lim_{x \to -\infty} f(x) = 0$; $\lim_{x \to \infty} f(x) = \infty$

B) Exponential decay function; $\lim_{x \to -\infty} f(x) = 0$; $\lim_{x \to \infty} f(x) = \infty$

C) Exponential growth function; $\lim_{x \to -\infty} f(x) = \infty$; $\lim_{x \to \infty} f(x) = 0$

D) Exponential decay function; $\lim_{x \to -\infty} f(x) = \infty$; $\lim_{x \to \infty} f(x) = 0$

2) $f(x) = 0.4^x$ 2) _____

A) Exponential growth function; $\lim_{x \to -\infty} f(x) = \infty$; $\lim_{x \to \infty} f(x) = 0$

B) Exponential decay function; $\lim_{x \to -\infty} f(x) = \infty$; $\lim_{x \to \infty} f(x) = 0$

C) Exponential decay function; $\lim_{x \to -\infty} f(x) = 0$; $\lim_{x \to \infty} f(x) = \infty$

D) Exponential growth function; $\lim_{x \to -\infty} f(x) = 0$; $\lim_{x \to \infty} f(x) = \infty$

Solve the inequality.

3) $\frac{5x + 9}{11} \geq -2$ 3) _____

A) $x \geq -\frac{31}{5}$ B) $x \leq -\frac{31}{5}$ C) $x \leq -\frac{13}{5}$ D) $x \geq -\frac{22}{5}$

Solve the equation.

4) $\log(3 + x) - \log(x - 5) = \log 5$ 4) _____

A) $\varnothing$ B) 7 C) -7 D) $\frac{7}{2}$

5) $\log(x - 9) = 1 - \log x$ 5) _____

A) $-10, 1$ B) -10 C) 10 D) $-1, 10$

Use limits to describe the behavior of the rational function near the indicated asymptote.

6) $f(x) = -\frac{8}{x + 2}$ 6) _____

Describe the behavior of the function near its vertical asymptote.

A) $\lim_{x \to 2^-} f(x) = \infty$, $\lim_{x \to 2^+} f(x) = -\infty$

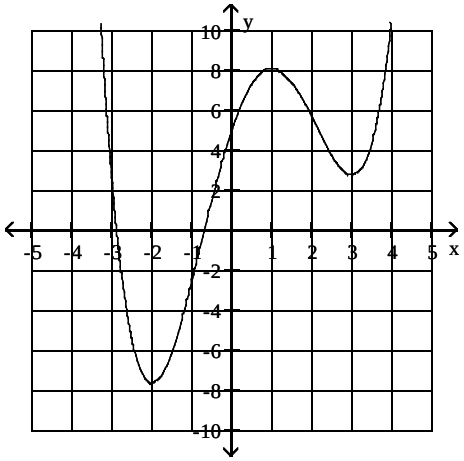
B) $\lim_{x \to -2^-} f(x) = 0$, $\lim_{x \to -2^+} f(x) = 0$

C) $\lim_{x \to -2^-} f(x) = \infty$, $\lim_{x \to -2^+} f(x) = -\infty$

D) $\lim_{x \to -2^-} f(x) = \infty$, $\lim_{x \to -2^+} f(x) = \infty$

Solve the problem.

7) Use the graph of f to estimate the local maximum and local minimum. 7) _____



A) No local maximum; local minimum: approx. –7.67
B) Local maximum: ∞; local minima: –2 and 3
C) Local maximum: 1; local minima: –2 and 3
D) Local maximum: approx. 8.08; local minima: approx. –7.67 and 2.75

8) Suppose the amount of a radioactive element remaining in a sample of 100 milligrams after x years can be described by $A(x) = 100e^{-0.02047x}$. How much is remaining after 351 years? Round the answer to the nearest hundredth of a milligram. 8) _____

A) 131,944.97 milligrams
B) 718.50 milligrams
C) 0.00 milligrams
D) 0.08 milligrams

9) The number of students infected with the flu on a college campus after t days is modeled by the function $P(t) = \frac{240}{1 + 39e^{-0.3t}}$. What is the maximum number of infected students possible? 9) _____

A) 480 B) 120 C) 240 D) 6

Determine algebraically whether the function is even, odd, or neither even nor odd.

10) $f(x) = x + \frac{11}{x}$ 10) _____

A) Neither B) Odd C) Even

Simplify the expression. Assume that the variables in the denominator are nonzero.

11) $\left(\frac{15a^6b^6}{ab^3}\right)\left(\frac{2b^2}{3a^3b^8}\right)$ 11) _____

A) $\frac{5a^2}{b^3}$ B) $\frac{10a^2}{b^3}$ C) $10a^2b^3$ D) $\frac{1}{10a^2b^3}$

12) $\frac{(2x^4)^3z^3}{2z^7}$ 12) _____

A) $\frac{4x^{12}}{z^4}$ B) $\frac{x^{12}}{z^4}$ C) $\frac{x^{12}}{4z^4}$ D) $4x^{12}z^4$

13) $\frac{\left(x^{-2}y^{5}\right)^{-3}}{\left(y^{5}x^{-4}\right)^{-4}}$ 13) _____

A) $\frac{x^{10}}{y^{5}}$ B) $\frac{y^{5}}{x^{6}}$ C) $\frac{y^{5}}{x^{10}}$ D) $\frac{x^{6}}{y^{5}}$

Describe how to transform the graph of f into the graph of g.

14) $f(x) = \sqrt{x}$ and $g(x) = \sqrt{0.4x}$ 14) _____

A) Vertically stretch the graph of f by a factor of 2.5.
B) Horizontally compress the graph of f by a factor of 40.
C) Vertically compress the graph of f by a factor of 40.
D) Horizontally stretch the graph of f by a factor of 2.5.

15) $f(x) = x^{5}$ and $g(x) = (5x)^{5}$ 15) _____

A) Horizontally stretch f by a factor of 5.
B) Vertically stretch f by a factor of 5.
C) Vertically compression of f by a factor of 4.
D) Horizontally compression f by a factor of 4.

Find the asymptote(s) of the given function.

16) $h(x) = \frac{36x^{2}}{9x^{2} - 3}$ horizontal asymptotes(s) 16) _____

A) $y = 4$ B) $y = 3$ C) $y = \sqrt{3}$ D) None

17) $f(x) = \frac{x - 3}{x^{2} + 7x}$ vertical asymptotes(s) 17) _____

A) $x = -7$ B) $x = 0, x = -7$ C) $x = 7$ D) $x = 3$

Find the domain of the given function.

18) $f(x) = \frac{\sqrt{x + 3}}{(x + 1)(x - 2)}$ 18) _____

A) $(-\infty, -3) \cup (-3 -1) \cup (-1, 2) \cup (2, \infty)$ B) $[-3, -1) \cup (-1, 2) \cup (2, \infty)$
C) All real numbers D) $(0, \infty)$

Solve the equation by changing it to exponential form.

19) $\log_{25} x = \frac{1}{2}$ 19) _____

A) $x = \frac{1}{2 \log_{25}(1/2)}$ B) $x = 25^{1/2}$

C) $x = (1/2)^{25}$ D) $x = \frac{25}{2}$

Solve the quadratic inequality by graphing an appropriate quadratic function.

20) $x^{2} + 2x - 35 \geq 0$ 20) _____

A) $[5, \infty)$ B) $(-\infty, -7] \cup [5, \infty)$ C) $(-\infty, -7]$ D) $[-7, 5]$

21) $x^2 - 7x \geq -12$ 21) _____

A) $[4, \infty)$ B) $(-\infty, 3] \cup [4, \infty)$ C) $[3, 4]$ D) $(-\infty, 3]$

22) $x^2 - 4x - 21 \leq 0$ 22) _____

A) $[7, \infty)$ B) $(-\infty, -3] \cup [7, \infty)$ C) $(-\infty, -3]$ D) $[-3, 7]$

Perform the requested operation or operations.

23) $f(x) = x^2 + 5$; $g(x) = \sqrt{x - 1}$ 23) _____

Find f(g(x)).

A) $f(g(x)) = \dfrac{\sqrt{x - 1}}{x^2 + 5}$ B) $f(g(x)) = (x^2 + 5)(\sqrt{x - 1})$

C) $f(g(x)) = \sqrt{x^2 + 4}$ D) $f(g(x)) = x + 4$

24) $f(x) = x^2 + 8$; $g(x) = \sqrt{x - 6}$ 24) _____

Find f(g(x)).

A) $f(g(x)) = x + 2$ B) $f(g(x)) = (x^2 + 8)(\sqrt{x - 6})$

C) $f(g(x)) = \dfrac{\sqrt{x - 6}}{x^2 + 8}$ D) $f(g(x)) = \sqrt{x^2 + 2}$

25) $f(x) = x^2 + 2$; $g(x) = \sqrt{x - 4}$ 25) _____

Find g(f(x)).

A) $g(f(x)) = \dfrac{\sqrt{x - 4}}{x^2 + 2}$ B) $g(f(x)) = \sqrt{x^2 - 2}$

C) $g(f(x)) = x - 2$ D) $g(f(x)) = (\sqrt{x - 4})(x^2 + 2)$

Solve the equation by extracting the square roots.

26) $5x^2 = 225$ 26) _____

A) $x = 3$ or $x = -3$ B) $x = 3\sqrt{5}$

C) $x = 3\sqrt{5}$ or $x = -3\sqrt{5}$ D) $x = 3$

Solve the inequality graphically.

27) $3^{-x} < 9^{-x}$ 27) _____

A) $x < 1$ B) $x > 0$ C) $x < 0$ D) $x > 1$

Compute the exact value of the function for the given x–value without using a calculator.

28) $f(x) = \left(\dfrac{1}{4}\right)^x$ for $x = -2$ 28) _____

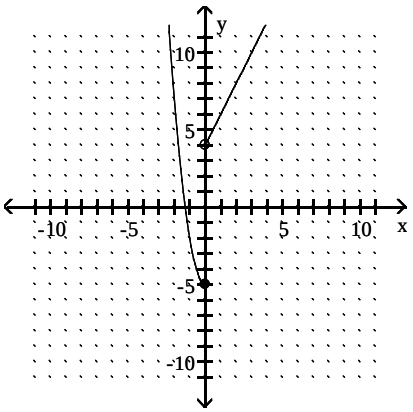
A) $-\dfrac{1}{16}$ B) 16 C) -8 D) $\dfrac{1}{16}$

Graph the piecewise–defined function.

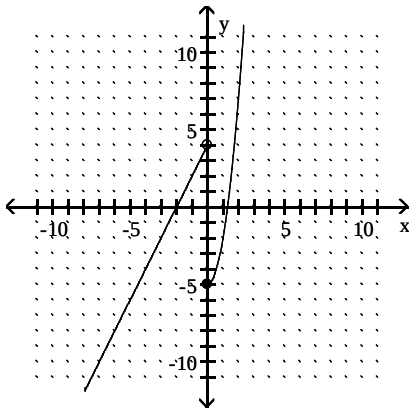
29) 29) _____

$$y(x) = \begin{cases} 2x + 4, \text{ if } x < 0 \\ 4x^2 - 5, \text{ if } x \geq 0 \end{cases}$$

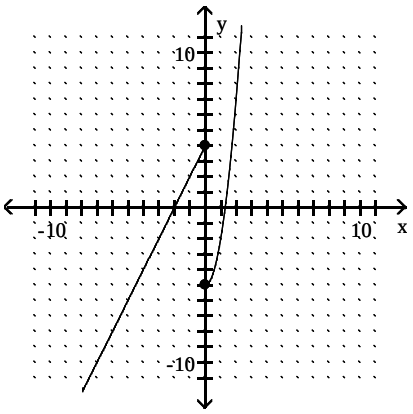
A)



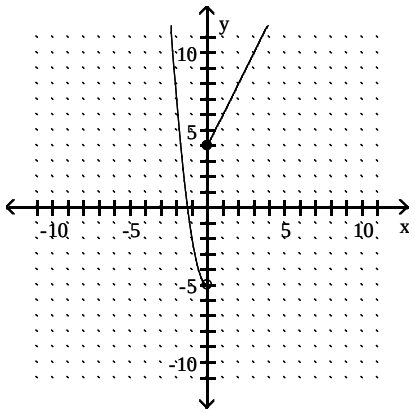
B)



C)



D)



Describe the end behavior of the polynomial function by finding $\lim_{x \to \infty} f(x)$ and $\lim_{x \to -\infty} f(x)$.

30) $f(x) = -x^3 - 2x^2 + 3x - 6$ 30) _____

A) $-\infty, \infty$ B) $\infty, -\infty$ C) $-\infty, -\infty$ D) ∞, ∞

Use the product, quotient, and power rules of logarithms to rewrite the expression as a single logarithm. Assume that all variables represent positive real numbers.

31) $7\ln(xy) - 4\ln(yz)$ 31) _____

A) $\dfrac{\ln(7xy)}{\ln(4yz)}$ B) $\dfrac{\ln(x^7y^7)}{\ln(y^4z^4)}$ C) $\ln\left(\dfrac{x^7y^3}{z^4}\right)$ D) $\ln\left(\dfrac{7x}{4z}\right)$

Perform the requested operation or operations. Find the domain of each.

32) $f(x) = \sqrt{x}$; $g(x) = 4x - 1$ 32) _____

Find f/g.

A) $(f/g)(x) = \frac{\sqrt{x}}{4x - 1}$; domain $\{x \mid x \neq \frac{1}{4}\}$

B) $(f/g)(x) = \frac{\sqrt{x}}{4x - 1}$; domain $\{x \mid x \geq 0, x \neq \frac{1}{4}\}$

C) $(f/g)(x) = \frac{\sqrt{x}}{4x - 1}$; domain $\{x \mid x \neq 0\}$

D) $(f/g)(x) = \frac{4x - 1}{\sqrt{x}}$; domain $\{x \mid x \geq 0\}$

Evaluate the logarithm.

33) $\log_8(32)$ 33) _____

A) $\frac{4}{3}$ B) $\frac{5}{4}$ C) $\frac{5}{3}$ D) $\frac{3}{2}$

1) A
2) B
3) A
4) B
5) C
6) C
7) D
8) D
9) C
10) B
11) B
12) A
13) C
14) D
15) D
16) A
17) B
18) B
19) B
20) B
21) B
22) D
23) D
24) A
25) B
26) C
27) C
28) B
29) B
30) A
31) C
32) B
33) C