

Name _____ Date _____ Period _____

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

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

$$1) \left(\frac{18a^6b^5}{ab^2} \right) \left(\frac{2b^2}{6a^3b^7} \right) \quad 1) \underline{\hspace{2cm}}$$

A) $\frac{1}{6a^2b^2}$ B) $6a^2b^2$ C) $\frac{3a^2}{b^2}$ D) $\frac{6a^2}{b^2}$

$$2) \frac{(x-2y^5)^{-2}}{(y^5x-4)^{-3}} \quad 2) \underline{\hspace{2cm}}$$

A) $\frac{y^5}{x^4}$ B) $\frac{x^4}{y^5}$ C) $\frac{x^8}{y^5}$ D) $\frac{y^5}{x^8}$

Perform the indicated operation. Write the result in standard form.

$$3) (6 + 7i)^2 \quad 3) \underline{\hspace{2cm}}$$

A) $-13 + 84i$ B) $85 + 84i$ C) $36 - 49i$ D) $36 + 49i$

Determine the equation of the line described. Put answer in the slope-intercept form, if possible.

$$4) \text{ Through } (-1, -1), \text{ perpendicular to } 5x + 2y = -3 \quad 4) \underline{\hspace{2cm}}$$

A) $y = \frac{5}{2}x + \frac{5}{2}$ B) $y = \frac{2}{5}x - \frac{3}{5}$ C) $y = -\frac{1}{2}x + \frac{3}{2}$ D) $y = -\frac{2}{5}x - \frac{3}{5}$

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

$$5) f(x) = \sqrt{x} \text{ and } g(x) = \sqrt{0.1x} \quad 5) \underline{\hspace{2cm}}$$

A) Horizontally shrink the graph of f by a factor of 10.
 B) Vertically stretch the graph of f by a factor of 10.
 C) Vertically shrink the graph of f by a factor of 10.
 D) Horizontally stretch the graph of f by a factor of 10.

Find the remainder when $f(x)$ is divided by $(x - k)$

$$6) f(x) = 2x^3 - 8x^2 - 3x + 13; k = -2 \quad 6) \underline{\hspace{2cm}}$$

A) -3 B) 19 C) 10 D) -29

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

$$7) f(x) = -x^3 + 2x^2 + 7x - 7 \quad 7) \underline{\hspace{2cm}}$$

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

Find the asymptote(s) of the given function.

$$8) f(x) = \frac{x-3}{x^2+8x} \text{ vertical asymptote(s)} \quad 8) \underline{\hspace{2cm}}$$

A) $x = -8$ B) $x = 8$ C) $x = 0, x = -8$ D) $x = 3$

9) $h(x) = \frac{10x^2}{5x^2 - 3}$ horizontal asymptotes(s)

9) _____

A) $y = \sqrt{3}$

B) None

C) $y = 2$

D) $y = 3$

Solve the problem.

10) The number of students infected with the flu on a college campus after t days is modeled by the function $P(t) = \frac{200}{1 + 39e^{-0.3t}}$. What is the maximum number of infected students possible?

10) _____

A) 5

B) 400

C) 100

D) 200

11) Suppose the amount of a radioactive element remaining in a sample of 100 milligrams after x years can be described by $A(x) = 100e^{-0.01322x}$. How much is remaining after 380 years? Round the answer to the nearest hundredth of a milligram.

11) _____

A) 15,195.74 milligrams

B) 0.66 milligrams

C) 502.36 milligrams

D) 0.01 milligrams

For the given function, find all asymptotes of the type indicated (if there are any)

12) $f(x) = \frac{x^2 - 3x + 2}{x + 8}$, slant

12) _____

A) $y = x - 11$

B) $x = y + 3$

C) $y = x + 5$

D) None

Find a slope-intercept form equation for the line.

13) Through the points (1, 5) and (-1, 9)

13) _____

A) $y = -2x + 7$

B) $y = -4x + 7$

C) $y = -2x + \frac{7}{2}$

D) $y = -2x - 7$

Find a cubic function with the given zeros.

14) $\sqrt{2}, -\sqrt{2}, -4$

14) _____

A) $f(x) = x^3 - 4x^2 - 2x - 8$

B) $f(x) = x^3 + 4x^2 + 2x - 8$

C) $f(x) = x^3 + 4x^2 - 2x - 8$

D) $f(x) = x^3 + 4x^2 - 2x + 8$

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

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

15) _____

Describe the behavior of the function near its vertical asymptote.

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

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

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

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

Perform the requested operation or operations.

16) $f(x) = x^2 + 8$; $g(x) = \sqrt{x - 7}$

Find $f(g(x))$.

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

B) $f(g(x)) = x + 1$

C) $f(g(x)) = (x^2 + 8)(\sqrt{x - 7})$

D) $f(g(x)) = \frac{\sqrt{x - 7}}{x^2 + 8}$

16) _____

Find the exponential function that satisfies the given conditions.

17) Initial mass = 5 g, decreasing at a rate of 3.9% per day

A) $m(t) = 3.9 \cdot 0.95^t$

B) $m(t) = 5 \cdot 0.961^t$

C) $m(t) = 5 \cdot 1.39^t$

D) $m(t) = 5 \cdot 1.039^t$

17) _____

18) Initial mass = 454 g, halving once every 21 hours

A) $m(t) = 454 \cdot \left(\frac{1}{2}\right)^{t/21}$

B) $m(t) = 454 \cdot 2^{21t}$

C) $m(t) = 454 \cdot 2^{t/21}$

D) $m(t) = 454 \cdot \left(\frac{1}{2}\right)^{21t}$

18) _____

Solve the inequality.

19) $\frac{5x + 10}{11} \geq -1$

A) $x \leq -\frac{1}{5}$

B) $x \geq -\frac{11}{5}$

C) $x \leq -\frac{21}{5}$

D) $x \geq -\frac{21}{5}$

19) _____

Find the zeros of the function.

20) $f(x) = 7x^3 - 28x^2 - 35x$

A) 1 and -5

B) 0, -1, and 5

C) -1 and 5

D) 0, 1, and -5

20) _____

Solve the inequality graphically.

21) $8 - x < 9 - x$

A) $x < 1$

B) $x < 0$

C) $x > 0$

D) $x > 1$

21) _____

Decide whether the function is an exponential growth or exponential decay function and find the constant percentage rate of growth or decay.

22) $f(x) = 4.9 \cdot 1.039^x$

A) Exponential decay function; 0.039%

B) Exponential growth function; 0.039%

C) Exponential growth function; 103.9%

D) Exponential growth function; 3.9%

22) _____

Divide $f(x)$ by $d(x)$, and write a summary statement in the form indicated.

23) $f(x) = x^2 - 6x + 5$; $d(x) = x - 3$ (Write answer in polynomial form)

A) $f(x) = (x - 3)(x + 1) + 4$

B) $f(x) = (x - 3)(x + 1) - 4$

C) $f(x) = (x - 3)^2 - 4$

D) $f(x) = (x - 3)^2 + 4$

23) _____

Find the zeros of the polynomial function and state the multiplicity of each.

31) $f(x) = -6x^2(x - 6)(x + 1)^3$

31) _____

- A) -1, multiplicity 3; 0, multiplicity 2; 6, multiplicity 1
- B) -1, multiplicity 3; 0, multiplicity 2; 1, multiplicity 1; 6, multiplicity 1
- C) -1, multiplicity 3; 6, multiplicity 1
- D) -1, multiplicity 1; 1, multiplicity 1; 6, multiplicity 1

Solve the quadratic inequality by graphing an appropriate quadratic function.

32) $x^2 - 10x + 21 \geq 0$

32) _____

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

Write the expression in standard form.

33) $\frac{1 + 3i}{5 + 7i}$

33) _____

- A) $\frac{13}{37} + \frac{4}{37}i$
- B) $-\frac{16}{37} - \frac{22}{37}i$
- C) $\frac{2}{3} + \frac{1}{6}i$
- D) $-\frac{13}{24} + \frac{1}{6}i$