

Find the inverse function of f . State the domain and range of f .

$$3) f(x) = \frac{3x - 2}{x + 5}$$

$$A) f^{-1}(x) = \frac{5x + 2}{3 + x}; \text{ domain of } f: \{x \mid x \neq -5\}; \text{ range of } f: \{y \mid y \neq -3\}$$

$$B) f^{-1}(x) = \frac{5x + 2}{3 - x}; \text{ domain of } f: \{x \mid x \neq -5\}; \text{ range of } f: \{y \mid y \neq 3\}$$

$$C) f^{-1}(x) = \frac{x + 5}{3x - 2}; \text{ domain of } f: \{x \mid x \neq -5\}; \text{ range of } f: \{y \mid y \neq \frac{2}{3}\}$$

$$D) f^{-1}(x) = \frac{5x + 2}{3 + x}; \text{ domain of } f: \{x \mid x \neq -5\}; \text{ range of } f: \{y \mid y \neq -\frac{2}{5}\}$$

Write as the sum and/or difference of logs. Express powers as factors.

$$4) \log_5 \frac{(p + w) \sqrt[7]{q}}{t^2}$$

$$A) \log_5 (p + w) + 7 \log_5 q - 2 \log_5 t$$

$$B) \log_5 p + \log_5 w + \frac{1}{7} \log_5 q - 2 \log_5 t$$

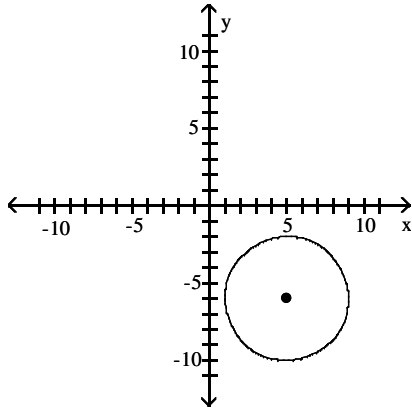
$$C) \log_5 p + \log_5 w - 7 \log_5 q - \frac{1}{2} \log_5 t$$

$$D) \log_5 (p + w) + \frac{1}{7} \log_5 q - 2 \log_5 t$$

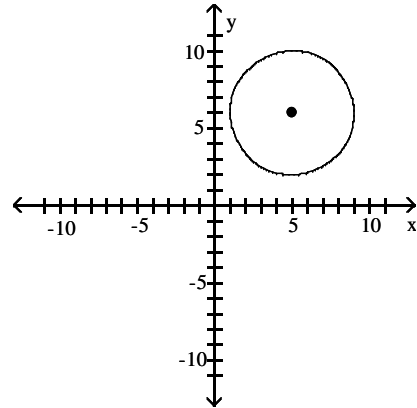
Find the center (h, k) and radius r of the circle. Graph the circle.

5) $x^2 + y^2 + 10x + 12y + 45 = 0$

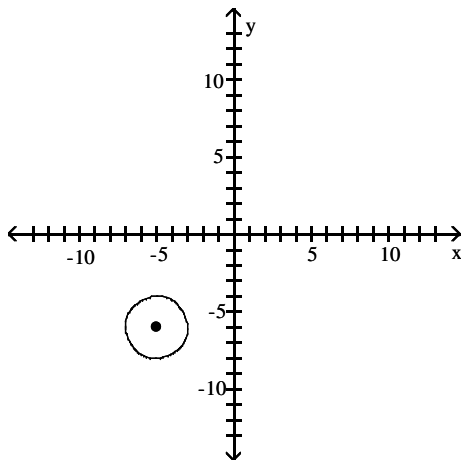
A) $(h, k) = (5, -6); r = 4$



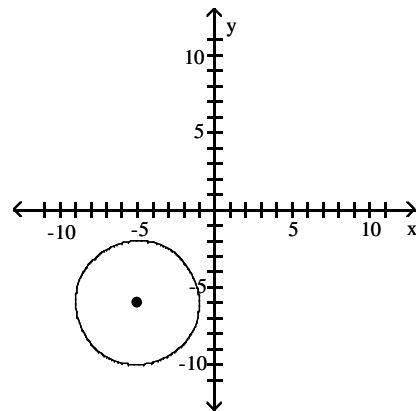
B) $(h, k) = (5, 6); r = 4$



C) $(h, k) = (-5, -6); r = 2$



D) $(h, k) = (-5, -6); r = 4$



Find the first term, the common difference, and give a recursive formula for the arithmetic sequence.

6) 7th term is 59; 15th term is 43

A) $a_1 = 73, d = -2, a_n = a_{n-1} - 2$

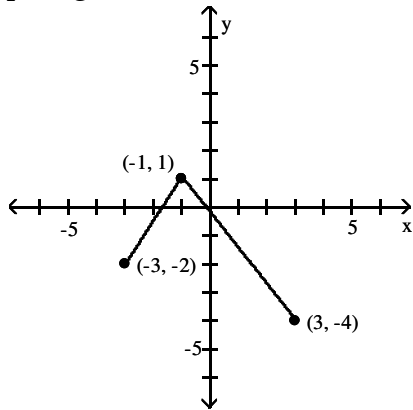
B) $a_1 = 71, d = 2, a_n = a_{n-1} + 2$

C) $a_1 = 73, d = 2, a_n = a_{n-1} + 2$

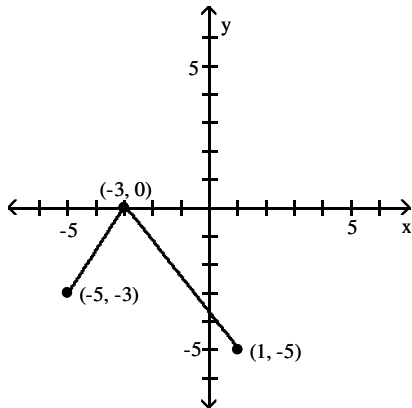
D) $a_1 = 71, d = -2, a_n = a_{n-1} - 2$

Using transformations, sketch the graph of the requested function.

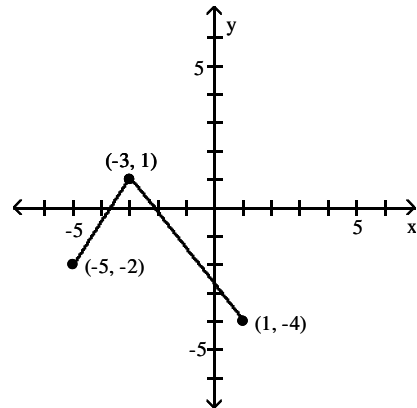
- 7) The graph of a function f is illustrated. Use the graph of f as the first step toward graphing the function $F(x)$, where $F(x) = f(x + 2) - 1$.



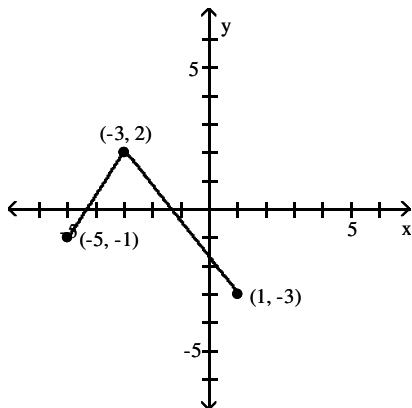
A)



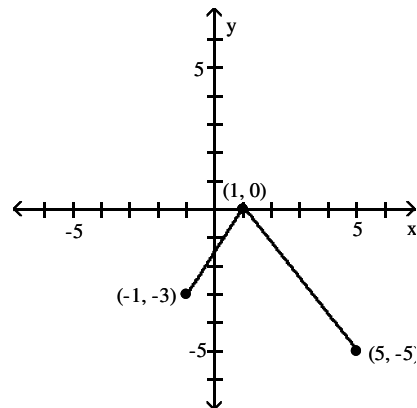
B)



C)



D)



Compute the product.

$$8) \begin{bmatrix} 0 & -3 & 1 \\ 5 & -1 & 0 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 0 & 1 \\ 1 & -1 \end{bmatrix}$$

A)

$$\begin{bmatrix} 0 & 10 \\ 0 & -1 \\ 0 & 0 \end{bmatrix}$$

B)

$$\begin{bmatrix} 1 & 5 \\ -4 & 9 \end{bmatrix}$$

C)

$$\begin{bmatrix} 10 & -5 & 1 \\ 5 & -1 & 0 \\ -5 & -2 & 0 \end{bmatrix}$$

D)

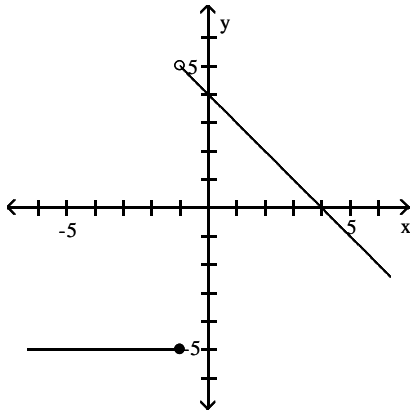
$$\begin{bmatrix} 1 & -4 \\ 5 & 9 \end{bmatrix}$$

Graph the function.

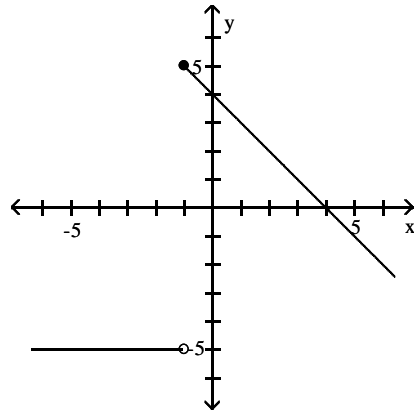
9)

$$f(x) = \begin{cases} x + 4 & \text{if } x < 1 \\ -5 & \text{if } x \geq 1 \end{cases}$$

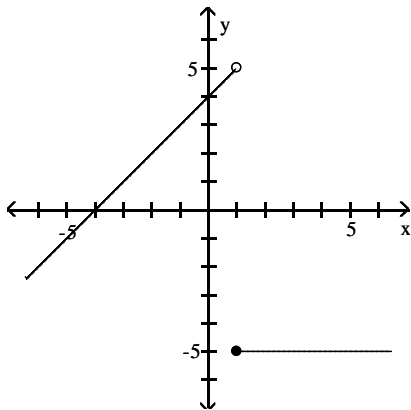
A)



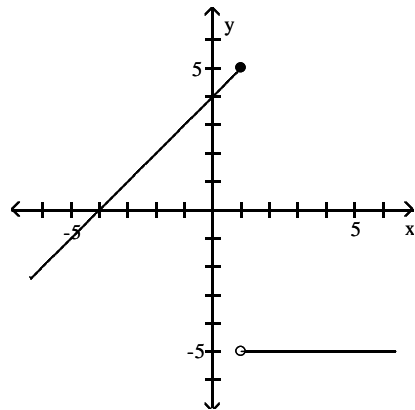
B)



C)



D)



For the polynomial, list each real zero and its multiplicity. Determine whether the graph crosses or touches the x-axis at each x-intercept.

10) $f(x) = 2(x + 1)(x - 5)^4$

- A) -1, multiplicity 1, touches x-axis; 5, multiplicity 4, crosses x-axis
- B) 1, multiplicity 1, crosses x-axis; -5, multiplicity 4, touches x-axis
- C) -1, multiplicity 1, crosses x-axis; 5, multiplicity 4, touches x-axis
- D) 1, multiplicity 1, touches x-axis; -5, multiplicity 4, crosses x-axis

Answer Key

Testname: CA-FINALAMC

- 1) D
- 2) C
- 3) B
- 4) D
- 5) D
- 6) D
- 7) A
- 8) D
- 9) C
- 10) C

PART II: Questions 11 - 20, Open ended

Answer all TEN questions. You must show all your work in a clear and logical progression and clearly indicate your answer to receive full credit.

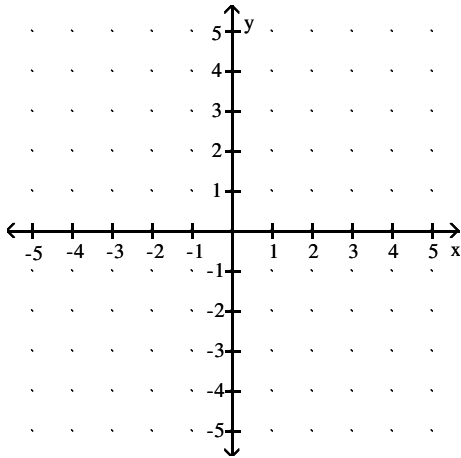
For the function, find the average rate of change of f from 1 to x:

$$\frac{f(x) - f(1)}{x - 1}, x \neq 1$$

11) $f(x) = 2x^2 - 3x - 1$

Use transformations to graph the function. Determine the domain, range, and horizontal asymptote of the function.

12) Graph the function $f(x) = 3^x - 2$. Determine the domain, range, and horizontal asymptote.

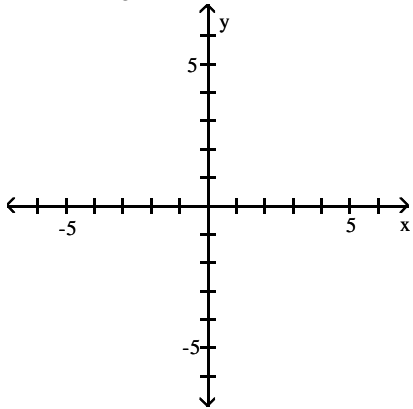


Find all of the zeros of the polynomial function.

$$13) f(x) = 3x^3 + 5x^2 - 17x + 5$$

Graph the function and list at least three (x, y) ordered pairs that lie on the graph.

$$14) y = \log_3 x$$



Solve the system using the inverse matrix method.

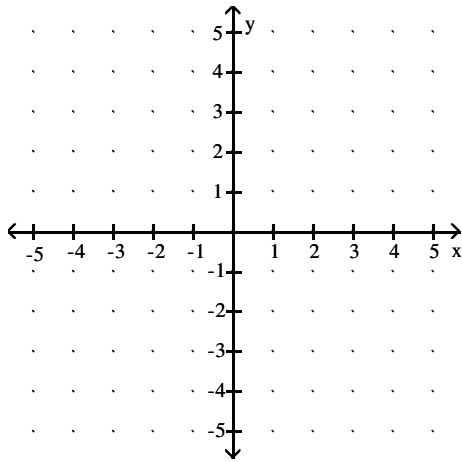
15)

$$\begin{cases} x + 2y + 3z = -5 \\ x + y + z = -6 \\ -x + y + 2z = 1 \end{cases}$$

The inverse of $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 1 \\ -1 & 1 & 2 \end{bmatrix}$ is $\begin{bmatrix} 1 & -1 & -1 \\ -3 & 5 & 2 \\ 2 & -3 & -1 \end{bmatrix}$.

Find the intercepts and graph the rational function.

$$16) f(x) = \frac{x - 2}{(x + 1)(x - 3)}$$



Solve the system of equations using Cramer's Rule if it is applicable. If Cramer's Rule is not applicable, say so.

17)

$$\begin{cases} 4x - 7y = 5 \\ 2x + 5y = -3 \end{cases}$$

Solve the problem.

- 18) A culture of bacteria obeys the law of uninhibited growth. If 140,000 bacteria are present initially and there are 609,000 after 6 hours, how long will it take for the population to reach one million? Round your answer to the nearest thousandth.

Find the sum of the infinite geometric series.

19)

$$\sum_{k=1}^{\infty} 6 \left(\frac{1}{3} \right)^{k-1}$$

Solve the problem.

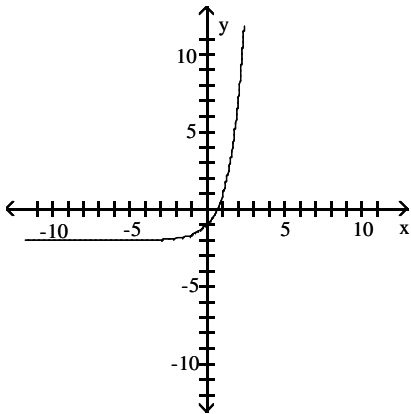
- 20) The owner of a video store has determined that the cost C , in dollars, of operating the store is approximately given by $C(x) = 2x^2 - 28x + 620$, where x is the number of videos rented daily. Find the lowest cost to the nearest dollar.

Answer Key

Testname: CA-FINALAOE

11) $2x - 1$

12)



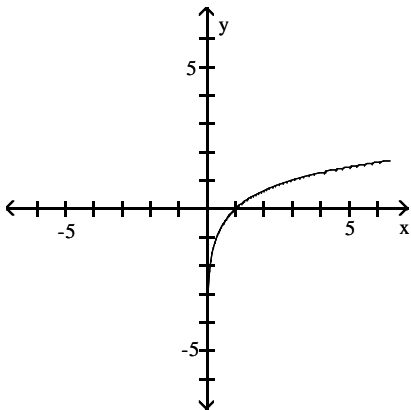
domain: $(-\infty, \infty)$

range: $(-2, \infty)$

horizontal asymptote: $y = -2$

13) $-1 + \sqrt{6}$, $-1 - \sqrt{6}$, $1/3$

14)



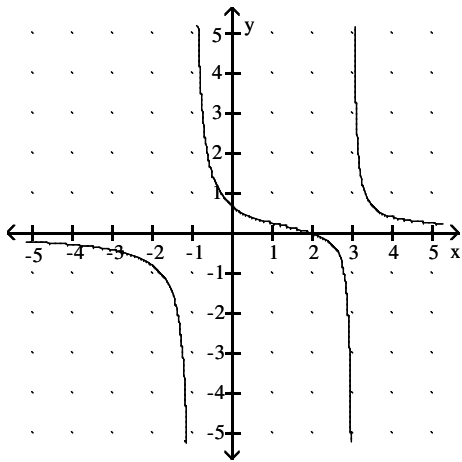
Ordered pairs $(\frac{1}{3}, -1)$, $(1, 0)$, $(3, 1)$, $(9, 2)$, etc.

15) $x = 0$, $y = -13$, $z = 7$

Answer Key

Testname: CA-FINALAOE

16) Intercepts: $(0, 2/3)$ and $(2, 0)$



17) $x = \frac{2}{17}, y = -\frac{11}{17}$

18) 8.024 hours

19) 9

20) \$522

PART III: Questions 21 – 30, Self select

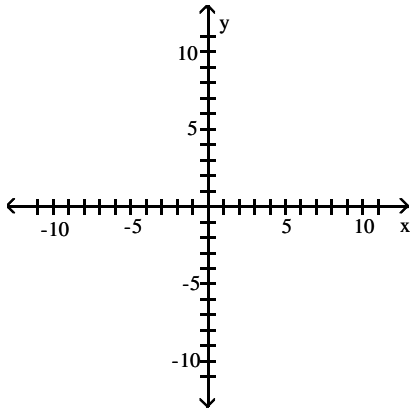
Choose FIVE out of the next TEN questions to complete. You must show all your work and clearly indicate your answer for full credit. CROSS OUT the problems that you do not want graded.

Write the partial fraction decomposition of the rational expression.

21)
$$\frac{8x + 1}{(x - 1)(x^2 + x + 1)}$$

Write an equation for the ellipse satisfying the given conditions. Graph the ellipse.

22) Foci at $(-2, 1)$ and $(4, 1)$; length of major axis is 10



Solve the problem.

- 23) What principal invested at 8% compounded continuously for 4 years will yield \$1190?
Round the answer to two decimal places.

Solve the problem.

- 24) A right triangle has one vertex on the graph of $y = x^2$ at (x, y) , another at the origin, and the third on the (positive) y -axis at $(0, y)$. Express the area A of the triangle as a function of x .

Solve the equation. Give BOTH the exact solution and the approximate solution to the nearest hundredth.

25) $4(3^x - 1) = 19$

Find the value of the determinant without using your calculator, showing all of your steps.

26)

$$\begin{vmatrix} 3 & 5 & 1 \\ -2 & 0 & 2 \\ 4 & -1 & 3 \end{vmatrix}$$

Find the composite function $(f \circ g)(x)$, and state its domain.

$$27) f(x) = \frac{6}{x-8}; \quad g(x) = \frac{-72}{x}$$

Solve the problem.

28) The logistic growth model $P(t) = \frac{940}{1 + 19.89e^{-0.337t}}$ represents the population of a bacterium in a culture tube after t hours. When will the amount of bacteria be 740? Round your answer to the nearest hundredth of an hour.

29) A brick staircase has a total of 18 steps. The bottom step requires 116 bricks. Each successive step requires 5 less bricks than the prior one. How many bricks are required to build the staircase?

Form a polynomial $f(x)$ with real coefficients having the given degree and zeros.

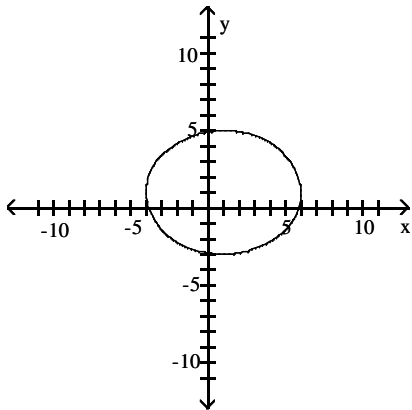
30) Degree: 3; zeros: -2 and $3 + i$.

Answer Key

Testname: CA-FINALASS

21) $\frac{3}{x-1} + \frac{-3x+2}{x^2+x+1}$

22)



$$\frac{(x-1)^2}{25} + \frac{(y-1)^2}{16} = 1$$

23) \$864.12

24) $A(x) = \frac{1}{2}x^3$

25) $x = \frac{\ln 19 + \ln 4}{3 \ln 4} = \frac{\ln 76}{\ln 4^3}$ or approximately 1.04

26) 78

27) $f \circ g = -\frac{6x}{8x+72} = -\frac{3x}{4x+36}$; domain: $\{x \mid x \neq 0, x \neq -9\}$

28) 12.76 hours

29) 1323 bricks

30) $f(x) = x^3 - 4x^2 - 2x + 20$