★2026 MIDTERM EXAM REVIEW★

A2CP

Name:_____

Hour:_____

Midterm Exam Schedule			
Teacher	Hour	Date	Time
Shelson	2nd Hour	Tuesday, January 20th	9:45 AM – 11:15 AM
Barbour	5th Hour	Wednesday, January 21st	9:45 AM – 11:15 AM
Barbour	6th Hour	Thursday, January 22nd	8:00 AM – 9:30 AM
Philliben	3rd Hour	Friday, January 23rd	8:00 AM – 9:30 AM

UNIT 1: FUNCTION NOTATION & QUADRATICS

Let $f(x) = -x^2 + 4x - 5$ and $g(x) = 2x + 3$. Evaluate and simplify the expression.

1. $f(-3)$

2. $-4g(x) + 5$

3. $g(x) + f(x)$

4. $f(1) - 7g(-6)$

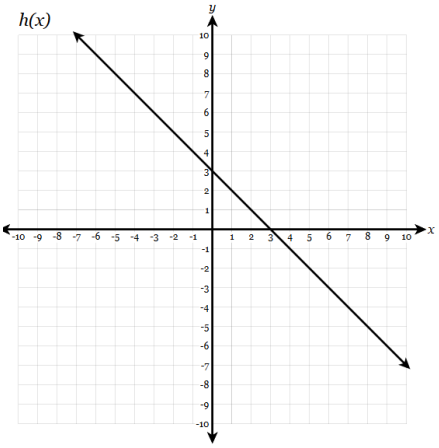
5. $f(x)g(x)$

6. $g^2(x)$

7. Find x when $f(x) = -2$.

8. Find x when $g(x) = 0$.

Consider the functions $h(x)$ (shown in the graph), $g(x)$ (equation), and $f(x)$ (table), evaluate and simplify the expression.



$$g(x) = -3x^2 - 2x - 1$$

x	$f(x)$
5	-9
8	3
1	-8
3	-5
-1	7

9. $f(3) - h(0)$

10. Find x when $h(x) = -2$. Then find $f(x)$.

11. $f(3) - g(x)$

***Factor* the expression completely.**

12. $2x^2 - 50$

13. $x^3 + 3x^2 - 70x$

14. $-8x^2 - 2x + 6$

15. $8x^2 + 10x - 3$

16. $-6x^2 + 3x + 18$

17. $3x^2 + 18x - 21$

Solve the equation. You may use any method to solve. Please simplify your answers!

18. $4x^2 = 20x$

19. $3x^2 + 4x = 15$

20. $3x^2 - 5x + 9 = 0$

21. $x^2 + 6x - 39 = 0$

22. $3x^2 + 12 = 0$

23. $4(x - 3)^2 = 24$

24. [**MCQ**] What is the SUM of the solutions to the equation $3x^2 - 14x - 5 = 0$?

A. $\frac{14}{3}$
B. $\frac{16}{3}$
C. $-\frac{14}{3}$
D. $\frac{2}{3}$

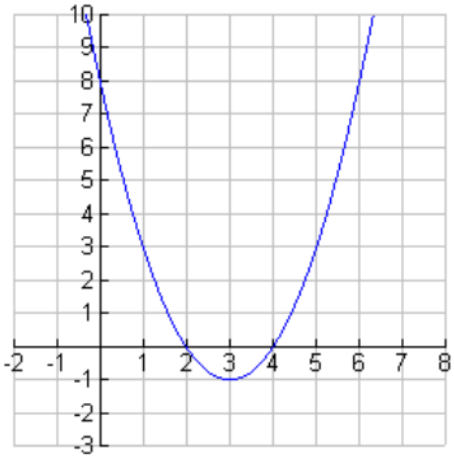
25. [**MCQ**] What are the coordinates of the vertex of the graph of $y = 4x^2 + 8x - 2$?

A. $(-6, -1)$
B. $(8, -2)$
C. $(-1, -6)$
D. $(8, -6)$

26. [**MCQ**] What equation is equivalent to $y = x^2 - 26x + 41$?

A. $y = -(x + 13)^2 - 210$
B. $y = -(x - 13)^2 - 210$
C. $y = (x + 13)^2 - 128$
D. $y = (x - 13)^2 - 128$

Use the graph below to answer the MCQs #27 and #28.



27. What is the equation of the graph shown?

A. $y = -(x-3)^2 - 1$

B. $y = -x^2 + 6x - 8$

C. $y = (x+3)^2 + 1$

D. $y = (x-2)(x-4)$

28. What is the equation of the axis of symmetry?

A. $x = -3$

B. $y = -3$

C. $x = 3$

D. $y = 3$

Graph the quadratic function. Find the indicated information. Write domain and range in interval notation. NOTE: It might be helpful to consider what form the equation is given in!

29. $f(x) = -(x-4)^2 + 7$

Vertex:

Domain:

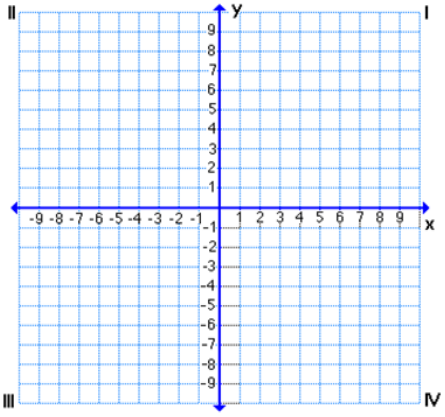
Range:

x-intercept(s):

Max/Min VALUE:

End Behavior:

y-intercept:



30. $f(x) = x^2 + 2x - 8$

Vertex:

Domain:

Range:

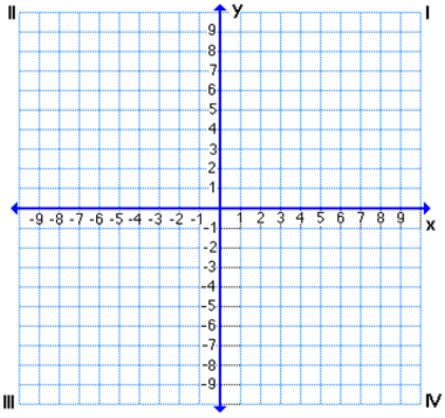
x-intercept(s):

Max/Min VALUE:

Rewrite f in VERTEX form:

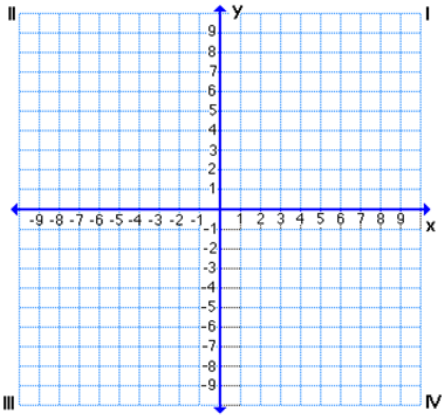
y-intercept:

End Behavior:



Graph the quadratic function. Find the indicated information. Write domain and range in interval notation. NOTE: It might be helpful to consider what form the equation is given in!

31. $f(x) = -2(x-2)(x+2)$



Vertex:

Domain:

Range:

x-intercept(s):

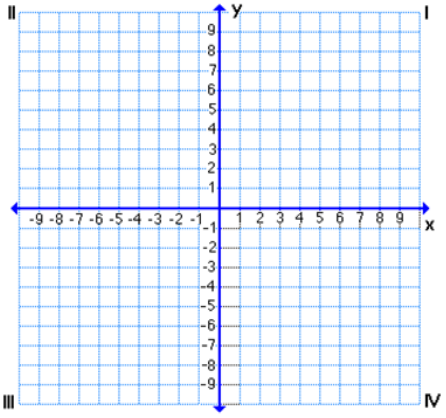
Max/Min VALUE:

Rewrite f in VERTEX form:

y-intercept:

End Behavior:

32. $f(x) = (x-3)(x+2)$



Vertex:

Domain:

Range:

x-intercept(s):

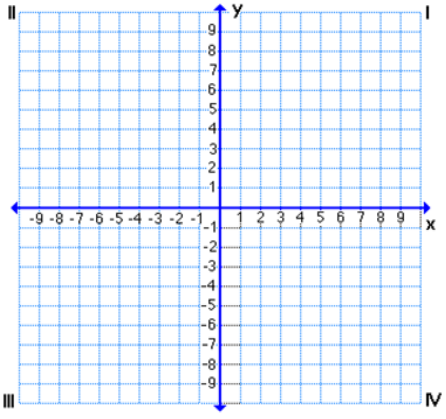
Max/Min VALUE:

Rewrite f in VERTEX form:

y-intercept:

End Behavior:

33. $f(x) = 3(x+1)^2 + 5$



Vertex:

Domain:

Range:

x-intercept(s):

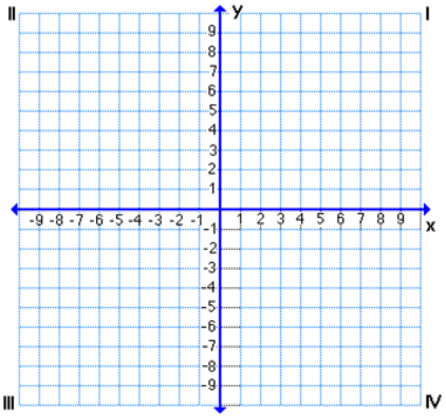
Max/Min VALUE:

y-intercept:

End Behavior:

Graph the quadratic function. Find the indicated information. Write domain and range in interval notation. NOTE: It might be helpful to consider what form the equation is given in!

34. $f(x) = -x^2 - 4x - 7$



Vertex:

Domain:

Range:

x-intercept(s):

Max/Min VALUE:

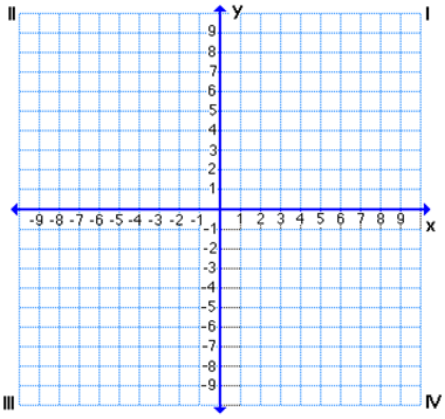
Rewrite f in VERTEX form:

y-intercept:

End Behavior:

35. Solve the system of equations by graphing.

$$\begin{cases} y = x^2 + 4x + 1 \\ y = x - 3 \end{cases}$$



36. Solve the system of equations algebraically.

$$\begin{cases} y = x^2 - 6x + 9 \\ y = -9x + 19 \end{cases}$$

37. Calvin and his friend are playing catch with a football. Calvin tosses the ball to AJ who catches it. The height h (in feet) of the football after t seconds can be modeled by $\boldsymbol{h(t) = -16t^2 + 64t + 7}$.

a) Find the **maximum height** of the football.

b) If AJ didn't catch the ball, then when would the football have hit the ground?

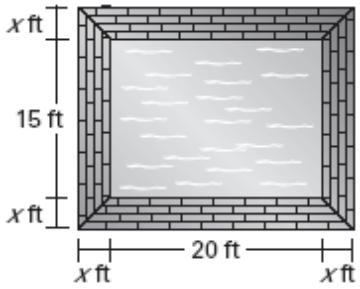
38. The profit P, in dollars, made by a small business on the production and sale of c items is given by $\boldsymbol{P(c) = -c^2 + 126c - 1100}$.

a) Find $P(0)$ and interpret its meaning in the context of this problem.

b) How many items should be produced and sold to earn a maximum profit?

39. A rectangular parking lot measures $8\,m$ by $4\,m$. You want to **triple** its area by adding the same distance x to the length and the width. Write and solve an equation to find the value of x. What are the new dimensions of the parking lot?

40. A pool deck of uniform width is going to be built around a rectangular pool that is 20 feet long and 15 feet wide. The deck will cover an area of 114 square feet. How wide is the deck that will encompass the pool?



41. Jordyn throws a ball straight into the air. The height $h(t)$ of the ball after t seconds is given by:

$$\boldsymbol{h(t) = -16t^2 + 60t}$$

a) How long does it take for the ball to hit the ground?

b) What is the maximum height reached by the ball?

c) After how many seconds did the ball take to reach its maximum height?

Unit 2: Polynomials

***Factor* the expression completely.**

1. $x^3 - 27$

2. $x^3 - 2x^2 - 9x + 18$

3. $x^3 - 3x^2 + 7x - 21$

4. $8x^3 + 1$

5. $27x^9 + 18x^6 - 72x^3$

6. $x^4 - 26x^2 + 25$

Divide the polynomials.

7. $(x^2 + 5x + 3) \div (x - 2)$

8. $(2x^3 + 5x^2 + 18x + 45) \div (2x + 5)$

9. [**MCQ**] Simplify: $\frac{x^5 + x^2 - 4}{x + 3}$

A. $x^4 - 3x^3 + 10x^2 - 30x + 90 + \frac{-274}{x+3}$

B. $x^4 - 3x^3 + 9x^2 - 26x + 78 + \frac{-238}{x+3}$

C. $x^4 - 2x^2 + \frac{2}{x+3}$

D. $x^4 - 2 + \frac{2}{x+3}$

10. Determine the value of k such that when $P(x) = kx^3 + 5x^2 - 2x + 3$ is divided by $x + 1$, the remainder is 7.

11. If $x - 5$ is a factor of $f(x) = 2x^3 - 23x^2 + 71x - 30$, find the remaining factors.

***Solve* the equation.**

12. $x^4 - 5x^2 + 4 = 0$

13. $x^3 + 3x^2 - 6x = 18$

14. $x^3 + 3x^2 - 14x - 20 = 0$

15. $8x^3 - 10x^2 + 3x = 0$

16. $x^4 - 6x^2 - 8x + 24 = 0$

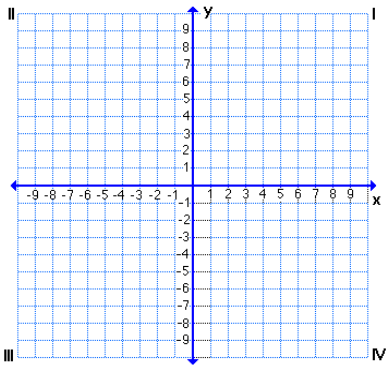
17. $2x^4 - 7x^2 + 5 = 0$

18. $4x^3 - 7x + 3 = 0$

19. $x^4 + 6x^3 + 7x^2 - 4x = 0$

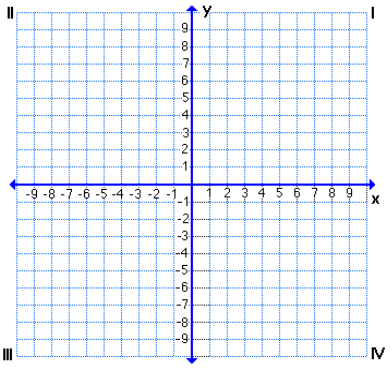
Find the zeros of the polynomial. Graph the polynomial using multiplicities and end behavior. Then state the end behavior using proper notation.

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



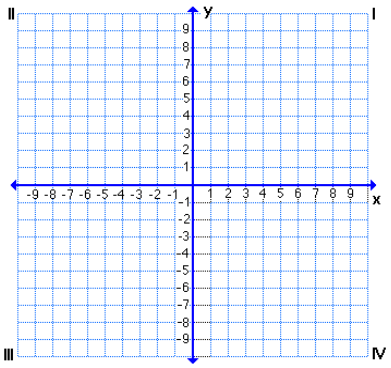
End Behavior:

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



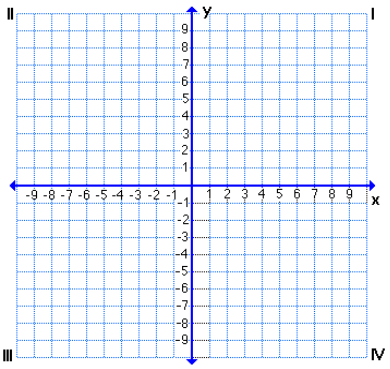
End Behavior:

22. $f(x) = x^3 + 4x^2 + x - 6$



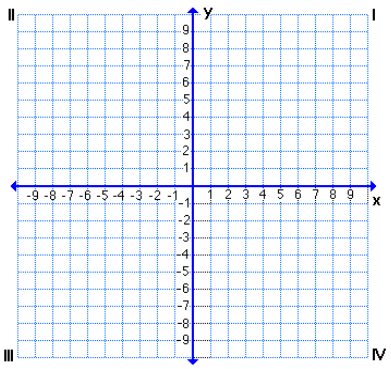
End Behavior:

23. $f(x) = -x^3 + 6x^2 + 9x - 54$



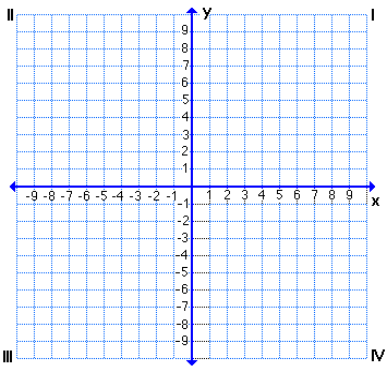
End Behavior:

24. $f(x) = 2x^5 - 34x^3 + 32x$



End Behavior:

25. $f(x) = -x^4 + 3x^3 + 17x^2 - 39x + 20$



End Behavior:

26. [**MCQ**] The end behavior of the function $h(x) = -475x^5 - 78x^3 + x^2 - 328$ is

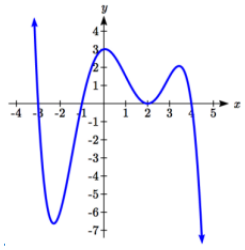
A. $As\ x \to -\infty,\ h(x) \to -\infty$
$As\ x \to \infty,\ h(x) \to \infty$

B. $As\ x \to -\infty,\ h(x) \to \infty$
$As\ x \to \infty,\ h(x) \to -\infty$

C. $As\ x \to -\infty,\ h(x) \to \infty$
$As\ x \to \infty,\ h(x) \to \infty$

D. $As\ x \to -\infty,\ h(x) \to -\infty$
$As\ x \to \infty,\ h(x) \to -\infty$

27. [**MCQ**] What is the equation for the graph shown below?



A. $y = (x+3)(x+1)(x-2)(x-4)$

B. $y = (x+3)(x+1)(x-2)^2(x-4)$

C. $y = -(x+3)(x+1)(x-2)^2(x-4)$

D. $y = -(x+3)(x+1)(x-2)(x-4)$

Perform the indicated operation. Write your answers in standard $a + bi$ form.

28. $3(-2+i) + i(4-8i)$

29. $2 + 8(7-9i) - (-1+6i)$

30. $(8-6i)(-4-4i)$

31. $(1-7i)^2$

32. $\frac{2-3i}{5i}$

33. $\frac{1+4i}{6+2i}$

Find a polynomial with the given zeros and meets any other conditions given.

34. $3\ multiplicity\ 2\ and\ -4$

35. $8\ and\ -5i$

36. $-1\ and\ \sqrt{3}$ and with end behavior $As\ x \to -\infty,\ h(x) \to \infty$
$As\ x \to \infty,\ h(x) \to -\infty$

Unit 3: Rational Functions

Simplify the expression.

1. $\frac{(2x^2y)^3}{14xy^7}$

2. $\frac{12x^3}{25y} \cdot \frac{40y}{9x^2}$

3. $\frac{7x^2}{12xy} \div \left(\frac{3x}{2y}\right)^2$

4. [**MCQ**] Simplify: $\frac{36x^5y^4}{96xy^8}$

A. $\frac{x^4}{3y^4}$ B. $\frac{3x^4y^4}{8}$ C. $\frac{x^4y^4}{3}$ D. $\frac{3x^4}{8y^4}$

Simplify the expression. *Remember to FACTOR first!*

5. $\frac{2x+6}{4x-12}$

6. $\frac{6x^2+24x}{x^2+7x+12}$

7. $\frac{x^2-x-12}{x^2-2x-8}$

8. $\frac{2x^2-7x+3}{2x^2+9x-5}$

9. $\frac{9x-18}{x^2+2x-8} \cdot \frac{3x+12}{6x}$

10. $\frac{x^2-2x}{6} \div \frac{3x-6}{x}$

11. $\frac{3x^2+7x-20}{x^2+4x+4} \cdot \frac{x^2-4}{9x^2-25}$

12. $\frac{\frac{3x^2-27}{x^2-12x+35}}{\frac{x+3}{x^2-x-20}}$

Simplify the expression. *Remember to FACTOR first!*

13. $\frac{5}{8} - \frac{3}{8x}$

14. $\frac{3}{2x^3} + \frac{2}{3x^2}$

15. $\frac{2}{4x+12} + \frac{7}{x+3}$

Simplify the expression. *Remember to FACTOR first!*

16. $\frac{2}{x-3}-\frac{1}{x+7}$

17. $\frac{3}{x+5}+\frac{x}{x^2+7x+10}$

18. $\frac{x}{x^2+11x+30}-\frac{5}{x^2+9x+20}$

19. $\frac{3}{x^2-9}+\frac{6}{x-3}$

20. $\frac{\frac{3}{x^2}+\frac{1}{x}}{2-\frac{4}{5x}}$

21. $\frac{\frac{2}{x+2}}{\frac{1}{x+2}+\frac{2}{x}}$

22. [**MCQ**] Simplify: $\frac{x^2-2x-24}{x^2-3x-18}-\frac{6}{x+3}$

A. $x-2$

B. $\frac{x+4}{x+3}$

C. $\frac{x-2}{x+3}$

D. $\frac{x^2-2x-30}{x^2-3x-18}$

Solve the equation. *Remember to check your answers!*

23. $\frac{5}{8x}-\frac{7}{4}=\frac{3}{2x}$

24. $5=\frac{4}{x}+\frac{9}{x+1}$

25. $\frac{3}{x-5}+\frac{2}{x+5}=\frac{30}{x^2-25}$

26. [**MCQ**] Solve the equation: $\frac{2}{x+2}-\frac{7}{x-3}=\frac{5}{x^2-x-6}$

A. -5

B. 5

C. $\frac{3}{5}$

D. $-\frac{3}{5}$

Find the equations of the vertical and horizontal asymptotes of the given function.

27. $f(x) = \frac{3x+5}{7x-9}$ **28**. $g(x) = \frac{4x+8}{3x^2-13x+4}$

29. [**MCQ**] Give the equation of the horizontal asymptote for the function $f(x) = \frac{2x^2-3x+2}{x^2-1}$.

A. $y = 0$ B. $x = 0$ C. $y = 2$ D. $x = 2$

Find the x- and y-intercepts of the given function.

30. $f(x) = \frac{2x^2-x-15}{x^2+7}$ **31**. $f(x) = \frac{4}{x+8}$ **32**. $f(x) = \frac{x-6}{x}$

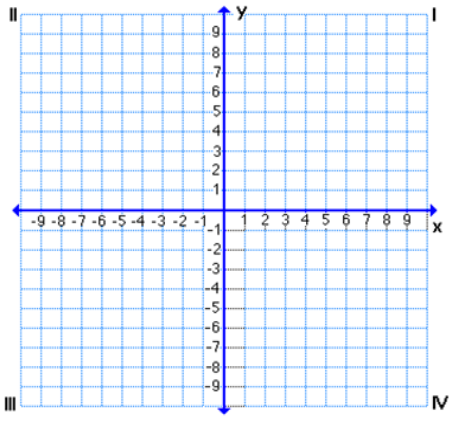
Find the missing information and graph the function.

33. $f(x) = \frac{-1}{x-4}$

HA: VA(s):

y-int: x-int(s):

End Behavior:

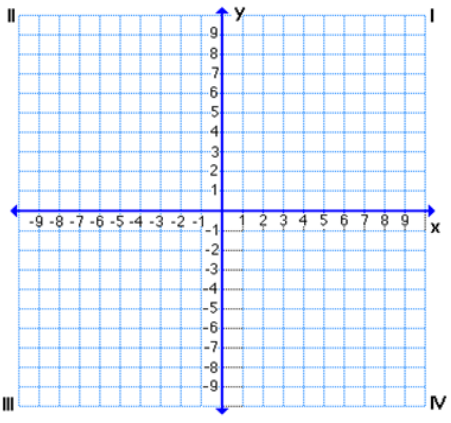


34. $f(x) = \frac{3x+6}{x+1}$

HA: VA(s):

y-int: x-int(s):

End Behavior:

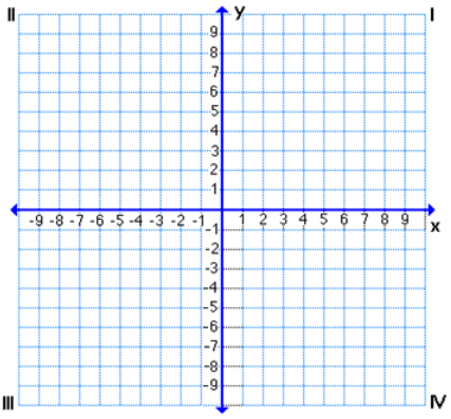


35. $f(x) = \frac{4x-2}{x}$

HA: VA(s):

y-int: x-int(s):

End Behavior:

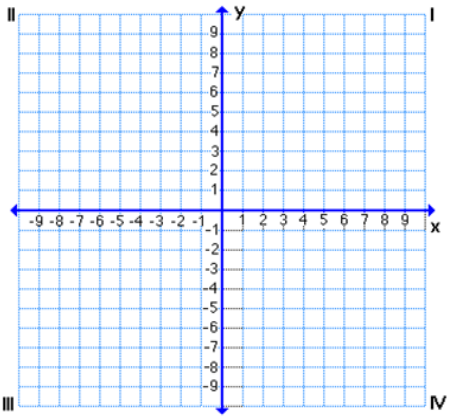


36. $f(x) = \frac{4x}{2x-5}$

HA: VA(s):

y-int: x-int(s):

End Behavior:

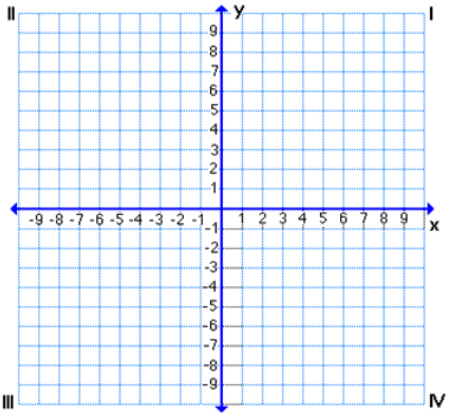


37. $f(x) = \frac{x}{x^2-4}$

HA: VA(s):

y-int: x-int(s):

End Behavior:

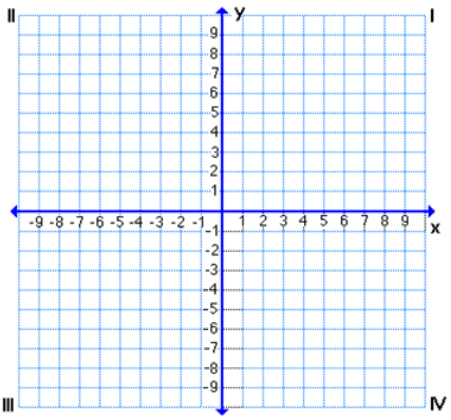


38. $f(x) = \frac{x^2-2x-3}{x^2+2x-8}$

HA: VA(s):

y-int: x-int(s):

End Behavior:

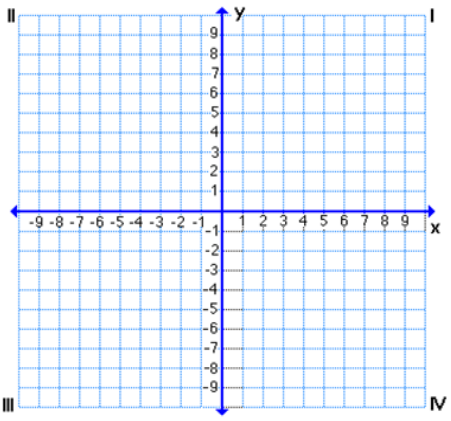


39. $f(x) = \frac{-4}{x^2 - 3x}$

HA: VA(s):

y-int: x-int(s):

End Behavior:

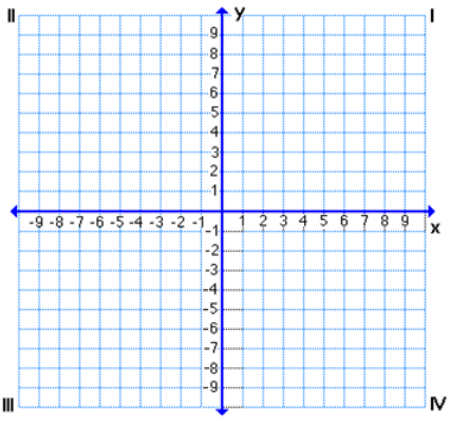


40. $f(x) = \frac{2x^2}{x^2 + x - 6}$

HA: VA(s):

y-int: x-int(s):

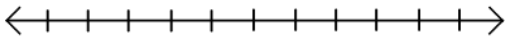
End Behavior:



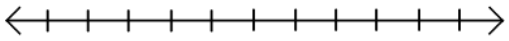
Inequalities, Interval Notation, and Domain

Solve the inequality and graph your solution on the number line. Write your final answer in interval notation.

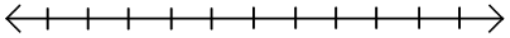
1. $2x - 4 \geq x + 2$



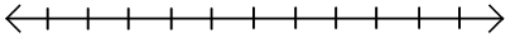
2. $5 - 3x > 20$



3. $x + 3 \leq -1$ or $4x > 0$

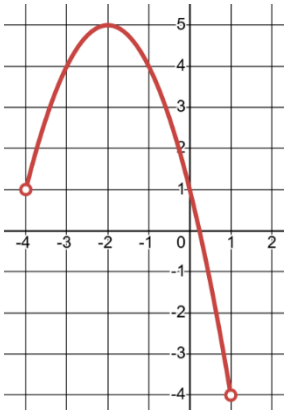


4. $-3 < 2x - 3 \leq 5$



Find the domain and range of the given graph. Write your answer in interval notation.

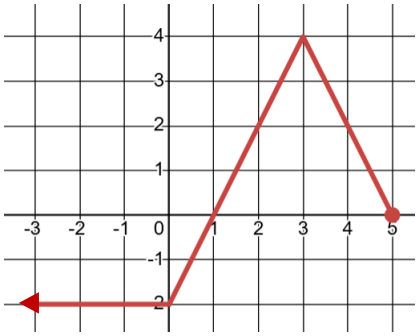
5.



Domain:

Range:

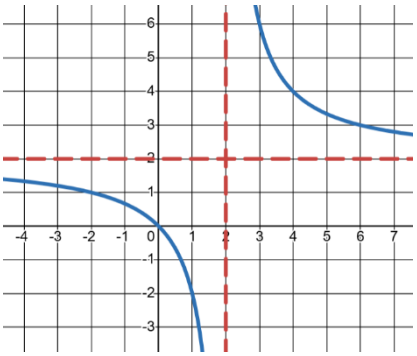
6.



Domain:

Range:

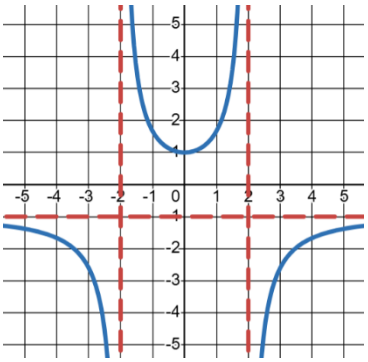
7.



Domain:

Range:

8.



Domain:

Range: