Midterm Review Modules 1–9   RUGGLES
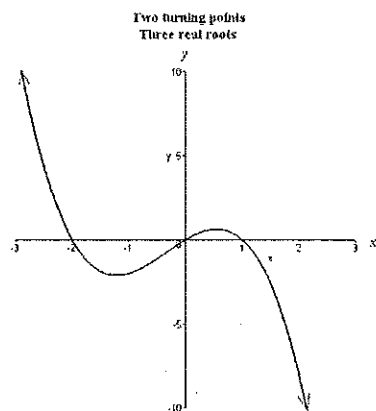
1. Identify the domain and range of the relation shown in the table?

x	-3	-2	4	11
y	-1	3	6	8

$D: \{-3, -2, 4, 11\}$

$R: \{-1, 3, 6, 8\}$

Refer to the figure below for 2–3.

Two turning points
Three real roots

2. Write the domain and range of the function in <u>interval notation and inequality notation</u>.

$D: -\infty < x < +\infty$
$(-\infty, \infty)$

$R: -\infty < y < +\infty$
$(-\infty, \infty)$

3. Describe the end behavior of the function.

As $x \to +\infty$, $y \to -\infty$

As $x \to -\infty$, $y \to +\infty$

4. Find the inverse of $f(x) = \frac{1}{2}x + 3$.
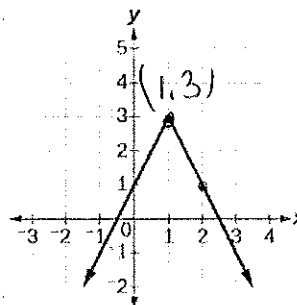
$f^{-1}(x) = 2x - 6$

5. Complete the table.

x	$y = -3|x+1|$	y
-3	$y = -3|(-3)+1|$	-6
-1		0
0		-3
1		-6
3		-12

6. Determine whether the functions
$f(x) = 2x + 4$ and $g(x) = \frac{x}{2} - 2$ are inverses.   Yes, both equal x.

The figure below shows a transformation of $y = |x|$. Refer to the figure for 7–8.

7. Write the function that is represented on the graph.

$f(x) = -2|x-1| + 3$

8. Write the domain and range of the graph.
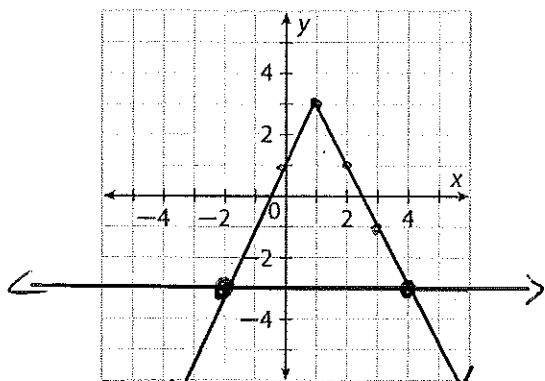
$D: (-\infty, +\infty)$

$R: (-\infty, 3]$

9. Solve $|x + 1| - 2 > 6$.

$$X > 7 \text{ or } X < -9$$

10. Solve $|x - 5| - 1 < 4$.

$$0 < X < 10$$

11. Solve the equation $-2|x - 1| + 3 = -3$ graphically.

$$X = -2 \text{ or } X = 4$$

12. Use fractional exponents to simplify $\sqrt[3]{x^6 y^5}$.

$$X^2 y^{\frac{5}{3}}$$

13. Simplify $32^{\frac{2}{5}}$.

$$4$$

14. What is $\left(\dfrac{8^{\frac{2}{3}}}{64^{\frac{2}{3}}}\right)^{\frac{1}{2}}$ simplified?

$$\frac{1}{2}$$

15. Simplify $\dfrac{18x^{-4}y^6}{8^{\frac{1}{3}}x^7 y^{-3}}$. Write your answer with positive exponents.

$$\frac{9y^9}{X^{11}}$$

16. Which monomial has a degree of 4?

   A $2x^5 y^2$

   B $-3x^4 y^4 z^4$

   (C) $6xyz^2$

   D $-5xy^2 z^3$

17. What is the sum of
$3x^2 + 4x - 4 - 5y^2 + 5y$ and
$x^2 - x - 13 + 6y^2$?

$$4x^2 + 3x + y^2 + 5y - 17$$

18. Which is the correct classification of $2x^2 yz + 3x^2 y - 4xy$?

   A binomial with a degree of 9

   (B) trinomial with a degree of 4

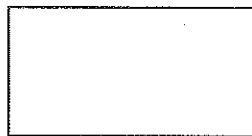   C trinomial with a degree of 9

   D monomial with a degree of 4

19. Simplify
$(3x^3 y^2 + 4x^3 - 10x^3 y^2) - (-x^3 + 4x - x^3 y^2)$.

$$5x^3 - 4x - 6x^3 y^2$$

Use the model below for 20–23.

2x in

(3x-1) in

20. Write an expression in simplest form to represent the perimeter of the rectangle in inches.

$$10X - 2 \text{ in.}$$

21. Find the perimeter when x = 3.

$$28 \text{ in.}$$

22. Write an expression in simplest form to represent the area of the rectangle in inches.

$$6x^2 - 2x \text{ in}^2$$

23. Find the area when x = 3.

$$48 \text{ in}^2$$

24. What is the opposite of $2x + 3y$?

$$-2x - 3y$$

25. What is the product of $(3x - 1)$ and

$(-2x^2 + 3x - 4)$?

$$-6x^3 + 11x^2 - 15x + 4$$

26. What is the product of $(x + 5)(x - 5)$?

$$x^2 - 25$$

27. What is the product of $(x - 8)^2$

$$x^2 - 16x + 64$$

28. What is a perfect square trinomial?

$$(a+b)^2 = a^2 + 2ab + b^2$$

29. Find the products.

a. $(3x - 4)^2$ $9x^2 - 24x + 16$

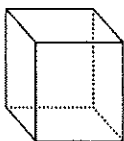b. $(3x - 1)(3x + 1)$ $9x^2 - 1$

c. $(2x + 3x)^2$ $25x^2$

d. $(ab + 2)(a - 3ab + b)$ $a^2b - 3a^2b^2 + ab^2 + 2a - 6ab + 2b$

e. $-3x(x + 5xy - 4x^2)$

$$-3x^2 - 15x^2y + 12x^3$$

30. The volume of the cube is $2x^2 - 2x - 40$.
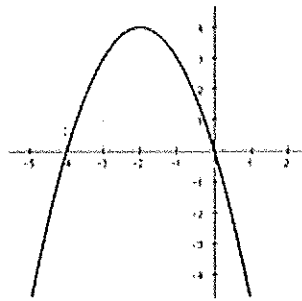Find an expression for the length.

H= 2

W=x - 5

$$2(x^2 - 2x - 20) = 2(x-5)(\quad?\quad)$$

$$= 2(x-5)(\quad)$$

$$\boxed{\ell = x + 4}$$

31.

a. Identify the vertex. $(-2, 4)$

b. Identify the axis of symmetry. $x = -2$

c. Find the equation of the function that represents the parabola.

$$y = -1(x+2)^2 + 4 \text{ or } y = -x^2 - 4x$$

d. Identify the maximum or minimum value of y. Maximum of 4 at -2.

e. The function above is translated 2 units left and 4 units up. Write an equation for this parabola.

$$y = -1(x+4)^2 + 8$$

32. For $y = -(x + 2)^2 + 3$, identify the maximum or minimum value of y.
Identify it as a maximum or minimum

maximum of 3 at -2.

33. The zeros of a quadratic function are –8 and –2. Find a possible vertex.

$(-5, \underline{\quad})$ any # except 0.

34. Find the vertex and axis of symmetry of
$f(x) = 4x^2 - 16x + 1 = 0$.

Vertex: $(2, -15)$

Axis of Symmetry: $x = 2$

35. Use the graph of $y = -x^2 - 2x + 3$ to solve $3 = -x^2 - 2x + 3$.

$$X = 0 \qquad X = -2$$

36. What are the solutions of $(2x+4)(3x-9) = 0$?

$$X = -2 \qquad X = 3$$

37. The height of a ball is modeled by $f(x) = -16x(x - .5)$, where x is the number of seconds after the ball is hit and $f(x)$ is the height of the ball in meters.

a. Find and interpret the vertex of the function. $\left(\frac{1}{4}, 1\right)$ The ball is 1 meter high at .25 seconds.
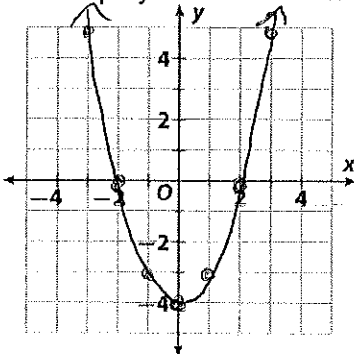
b. How long was the ball in the air? Justify your answer.

.5 seconds

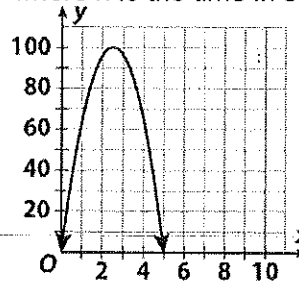38. Find the vertex and line of symmetry of $f(x) = -3x^2 + 18x + 2$ ~~~~

Vertex: $(3, 29)$

Axis of Symmetry: $X = 3$

39. Graph $y = x^2 - 4$ below.

X	y
-3	5
-1	-3
0	-4
1	-3
2	0
3	5

40. The height of a ball in feet is modeled by $f(x) = -16x^2 + 80x$, which is shown below, where x is the time in seconds after it is hit.

$$X = \frac{-b}{2a} = \frac{-80}{2(-16)} = \frac{-80}{-32}$$
$$= 2.5$$

a. How long is the ball in the air?

5 seconds

b. Find and interpret the vertex of the graph. The ball will reach 100 ft.

$(2.5, 100)$ in 2.5 seconds

$-100 + 80(2.5) = -100 + 200$
$= 100$

41. Write an equation of a quadratic function that has x-intercepts -2 and 5.

$$y = (x - (-2))(x - 5)$$
$$y = (x + 2)(x - 5)$$
$$y = x^2 - 3x - 10$$

42. What are the zeros of the function: $f(x) = x(x - 1) + 3(x - 1)$?

$$f(x) = (x + 3)(x - 1)$$
$$0 = (x + 3)(x - 1)$$
$$X + 3 = 0 \qquad X - 1 = 0$$
$$\boxed{X = -3} \qquad \boxed{X = 1}$$

43. What is the range of the function
y = 2(x - 1)² + 3?   Vertex: $(1, 3)$

$[3, \infty)$ or $y \geq 3$

44. Solve 2(x + 1)² = 18.

$X = 2, X = -4$

45. Factor: 25p² - 49x²

$(5p + 7x)(5p - 7x)$

46. Solve 2x² - 9x - 5 = 0 by factoring
$(2x + 1)(x - 5) = 0$
$2x + 1 = 0 \quad x - 5 = 0$
$X = -\frac{1}{2} \quad X = 5$

47. Solve: x² + 8x + 12 = 0

$X = -2 \quad X = -6$

48. Factor: x² – 6x – 16

$(x + 2)(x - 8)$

$1, -16 \quad -1, 16$
$2, -8 \quad -2, 8$

$(x + 2)(x - 8)$

49. Solve x² - 6x = 40 by factoring.

$X^2 - 6x - 40 = 0$
$(X - 10)(X + 4) = 0$

$X = 10, X = -4$

50. Which of the following will simplify to the correct solutions of y = 2x² + 5x – 7?

A $\dfrac{-5 \pm \sqrt{25 - 56}}{4}$ C $\dfrac{5 \pm \sqrt{25 - 56}}{4}$

B $\dfrac{-5 \pm \sqrt{25 + 56}}{4}$ D $\dfrac{5 \pm \sqrt{25 + 56}}{4}$