Algebra 1 Name Dey

WS Semester 2 Final Review

1) Find the mean, median and mode of each data set:

a) 3, 5, 1, 5, 1, 1, 2, 3, 15

mean: 4
median: 3
mode: 1

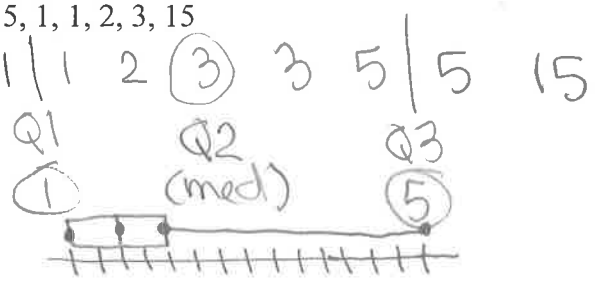
b) 14, 15, 3, 15, 14, 14, 18, 15, 8, 15

mean: 13.1
median: 14.5
mode: 15

2) Make a box plot using the data below.

3, 5, 1, 5, 1, 1, 2, 3, 15

1 1 | 1 2 (3) 3 5 | 5 15



a) Identify minimum, quartile 1, median, quartile 3 and maximum.

min = 1 max = 15
Q1 = 1
med = 3
Q3 = 5

b) What is the interquartile range?

Q3 − Q1
5 − 1 = 4

c) What is the range?

max − min
15 − 1 = 14

3) A student scored 75, 88, and 95 respectively on their first 3 unit exams. What do they have to score on their 4th exam to have an average of 87?

$$\frac{75+88+95+X}{4} = 87$$

$$4\left(\frac{258+X}{4}\right) = (87)4$$

$$258 + X = 348$$

$$X = 90\%$$

Simplify each.

4) $(5x^3 - 1 - 2x^2) + (8 + 8x^3 - x^4)$

$-x^4 + 13x^3 - 2x^2 + 7$

5) $(3x^3 + 7x^2 + 2x^4) + (8x^4 - 7x^2 - 4x^3)$

$10x^4 - x^3$

6) $(5x - 7x^4 - 8) - (1 - 8x^4 - 4x)$

$-1 + 8x^4 + 4x$

$x^4 + 9x - 9$

7) $(7x^4 + 5 + 5x^3) - (6x^4 - 7 - 5x^3)$

$-6x^4 + 7 + 5x^3$

$x^4 + 10x^3 + 12$

Find each product.

8) $(5n - 3)(n + 3)$

$5n(n+3) - 3(n+3)$

$5n^2 + 15n - 3n - 9$

$5n^2 + 12n - 9$

9) $(6x + 8)(2x + 4)$

$6x(2x+4) + 8(2x+4)$

$12x^2 + 24x + 16x + 32$

$12x^2 + 40x + 32$

10) $(3n - 1)(3n^2 + 2n + 5)$

$3n(3n^2+2n+5) - 1(3n^2+2n+5)$

$9n^3 + 6n^2 + 15n - 3n^2 - 2n - 5$

$9n^3 + 3n^2 + 13n - 5$

11) $(7x + 3)(8x^2 + 4x - 6)$

$7x(8x^2+4x-6) + 3(8x^2+4x-6)$

$56x^3 + 28x^2 - 42x + 24x^2 + 12x - 18$

$56x^3 + 52x^2 - 30x - 18$

Factor each completely.

12) $(2a^3 + 7a^2) + (10a + 35)$

$a^2(2a+7) + 5(2a+7)$

$(a^2+5)(2a+7)$

13) $(12k^3 + 2k^2) - (42k - 7)$

$2k^2(6k+1) - 7(6k+1)$

$(2k^2-7)(6k+1)$

14) $2x^2 + 6x - 56$

-28	
1	28
2	14
-4	7

$2(x^2+3x-28)$

$2(x-4)(x+7)$

15) $3x^3 - 4x^2 - 20x$

-60	
1	60
2	30
3	20
4	15
5	12
6	-10

$x(3x^2 - 4x - 20)$

$(3x^2 + 6x)(-10x - 20)$

$3x(x+2) - 10(x+2)$

$x(3x-10)(x+2)$

Solve each quadratic by using your method of choice (factoring, completing the square or quadratic formula).

16) $x^3 - 9x^2 + 20x = 0$

20: 1|20, 2|10, −4|−5

$x(x^2 - 9x + 20) = 0$

$x(x-4)(x-5) = 0$

$x = 0 \quad x-4=0 \quad x-5=0$

$+4\ +4 \qquad +5\ +5$

$x = 0, 4, 5$

17) $x^2 - 4x - 39 = 0$

$+39 \quad +39$

$x^2 - 4x + 4 = 39 + 4$

$\sqrt{(x-2)^2} = \sqrt{43}$

$x - 2 = \pm 6.56$

$+2 \quad +2$

$x = 2 \pm 6.56$

$2 + 6.56 = 8.56$

$2 - 6.56 = -4.56$

$x = 8.56, -4.56$

18) $x^2 - 4x - 8 = 0$

$x = \dfrac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-8)}}{2(1)}$

$= \dfrac{4 \pm \sqrt{48}}{2}$

$= \dfrac{4 \pm 6.92}{2}$

$\dfrac{4+6.92}{2} \qquad \dfrac{4-6.92}{2}$

$x = 5.46, -1.46$

19) $x^3 - 5x^2 + 5x + 25 = 0$

$x^2(x-5) - 5(x-5) = 0$

$(x^2 - 5)(x-5) = 0$

$x^2 - 5 = 0 \qquad x - 5 = 0$

$+5\ +5 \qquad +5\ +5$

$\sqrt{x^2} = \sqrt{5} \qquad x = 5$

$x = \pm 2.24$

$x = 5, 2.24, -2.24$

20) The length of a rectangle is $3x^2 - 2x + 4$ and the width is $4x^2 - 5$.

a) Find the area of the rectangle.

$(4x^2 - 5)(3x^2 - 2x + 4)$

$4x^2(3x^2 - 2x + 4) - 5(3x^2 - 2x + 4)$

$12x^4 - 8x^3 + 16x^2 - 15x^2 + 10x - 20$

$12x^4 - 8x^3 + x^2 + 10x - 20$

b) Find the perimeter of the rectangle.

$3x^2 - 2x + 4$

$4x^2 - 5$ | $4x^2 - 5$

$3x^2 - 2x + 4$

$14x^2 - 4x - 2$

21) The area of a rectangle is $6x^3 - 8x^2 + 12x$. If the width is $2x$, what is the length?

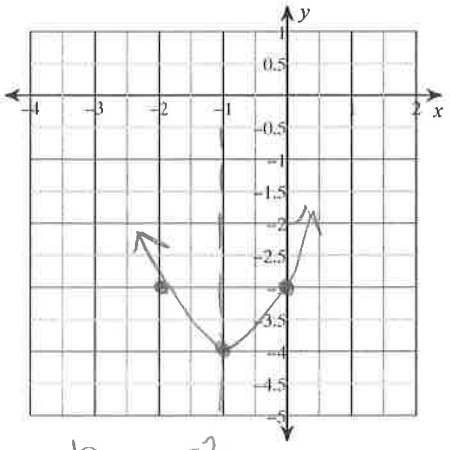
$6x^3 - 8x^2 + 12x$

$2x(3x^2 - 4x + 6)$

$l = 3x^2 - 4x + 6$

Sketch the graph of each function.

22) $y = x^2 + 2x - 3$



$x = \frac{-b}{2a} = \frac{-2}{2(1)} = -1$

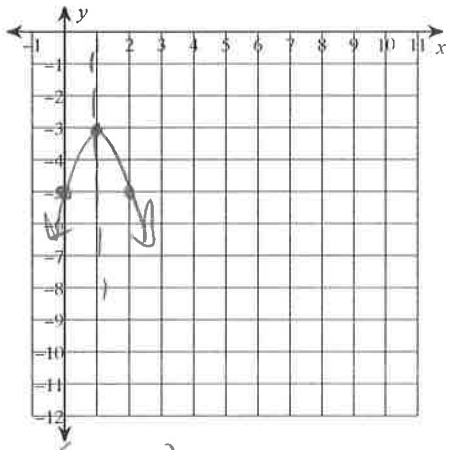
$(-1)^2 + 2(-1) - 3$

$1 - 2 - 3$

$(-1, -4)$

y-int $(0, -3)$

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



$(1, -3)$

$-2(0-1)^2 - 3$

$-2(-1)^2 - 3$

$-2(1) - 3$

$-2 - 3$ y-int $(0, -5)$

-5

24) Using the graph from question #~~23~~22 answer the following:

a) What is the vertex? $(-1, -4)$

b) What is the axis of symmetry? $x = -1$

c) What is the y-intercept (as an ordered pair)? $(0, -3)$

d) What is the domain? $D: \{x \in \mathbb{R}\}$

e) What is the range? $R: \{y \geq -4\}$

f) Does it have a maximum or a minimum? min What is the value? -4

g) What are the zeros of the function? $-3, 1$

$(x + 3)(x - 1)$

$x + 3 = 0 \quad x - 1 = 0$

$x = -3 \quad x = 1$

25) Using the graph from question #~~24~~23 answer the following:

a) What is the vertex? $(1, -3)$

b) What is the axis of symmetry? $x = 1$

c) What is the y-intercept (as an ordered pair)? $(0, -5)$

d) What is the domain? $D: \{x \in \mathbb{R}\}$

e) What is the range? $R: \{y \leq -3\}$

f) Does it have a maximum or a minimum? max What is the value? -3

g) What are the zeros of the function? none

Describe the transformation of each quadratic function.

26) $y = -(x-3)^2 - 4$

open down
right 3
down 4

27) $y = \frac{1}{2}(x-4)^2 + 2$

open up
compress
right 4
up 2

Write a quadratic function in vertex form to represent the transformation.

28) opens up, left 8 and down 17, stretched by a factor of 4

$f(x) = 4(x+8)^2 - 17$

29) up 9, right 12, opens down, compressed by $\frac{3}{7}$

$y = -\frac{3}{7}(x-12)^2 + 9$

30) The function $h(x) = -16x^2 + 32x + 2$ represents the height in feet of a softball after x seconds. Find the maximum height of the softball.

$x = \frac{-b}{2a} = \frac{-32}{2(-16)} = \frac{-32}{-32} = 1$

$-16(1)^2 + 32(1) + 2$

$-16 + 32 + 2 =$ **18 ft**

Solve each equation by completing the square.

31) $n^2 - 8n + 11 = 4$

$-11 \quad -11$

$n^2 - 8n + 16 = -7 + 16$

$\sqrt{(n-4)^2} = \sqrt{9}$

$n - 4 = \pm 3$

$+4 \quad +4$

$n = 4 \pm 3$

$4+3 \quad 4-3$

$7, 1$

32) $5v^2 - 10v - 50 = -10$

$+50 \quad +50$

$\frac{5v^2}{5} - \frac{10v}{5} + \_ = \frac{40}{5} + \_$

$v^2 - 2v + 1 = 8 + 1$

$\sqrt{(v-1)^2} = \sqrt{9}$

$v - 1 = \pm 3$

$+1 \quad +1$

$v = 1 \pm 3$

$1+3 \quad 1-3$

4, -2

Solve each equation with the quadratic formula.

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

33) $3b^2 - 27 = 0$

$x = \frac{-0 \pm \sqrt{0^2 - 4(3)(-27)}}{2(3)}$

$= \frac{-0 \pm \sqrt{324}}{6} = \frac{\pm 18}{6}$

$\frac{18}{6} \quad \frac{-18}{6}$

3, -3

34) $2x^2 - 3x - 133 = 2$

$-2 \quad -2$

$2x^2 - 3x - 135 = 0$

$x = \frac{3 \pm \sqrt{(-3)^2 - 4(2)(-135)}}{2(2)}$

$= \frac{3 \pm \sqrt{1089}}{4} = \frac{3 \pm 33}{4}$

$\frac{3+33}{4} = 9$

$\frac{3-33}{4} = -7.5$

35) As Molly dives into her pool, her height above the water can be modeled by the function $f(x) = -16x^2 + 72x$, where x is the time in seconds after she begins diving. How long does it take Molly to reach the pool?

$-16x^2 + 72x = 0$

$-8x(2x - 9) = 0$

$\frac{-8x}{-8} = \frac{0}{-8}$

$x = 0$

$2x - 9 = 0$

$+9 \quad +9$

$\frac{2x}{2} = \frac{9}{2}$

$x = 4.5$ sec

36) A diver begins on a platform 11 meters above the surface of the water. The diver's height is given by the equation $h(t) = -2t^2 + t + 11$, where t is the time in seconds after the diver jumps. How long does it take the diver to reach a point 1 meter above the water?

$1 = -2x^2 + x + 11$

$-1 \quad -1$

$-2x^2 + x + 10 = 0$

$x = \frac{-1 \pm \sqrt{(1)^2 - 4(-2)(10)}}{2(-2)}$

$= \frac{-1 \pm \sqrt{81}}{-4}$

$\frac{-1 \pm 9}{-4}$

$\frac{-1+9}{-4} = -2$

$\frac{-1-9}{-4}$

2.5 sec

37) An Olympic diver's height can be modeled by the function $h = -3x^2 + 6x + 24$, where x is the time in seconds after he begins the dive.

a) How long does it take the diver to hit the water?

$-3x^2 + 6x + 24 = 0$

$-3(x^2 - 2x - 8) = 0$

$-3(x + 4)(x - 2) = 0$

$x + 4 = 0 \quad x - 2 = 0$

$x = -4 \quad x = 2$

2 sec

b) What is the initial height of the swimmer?

24 ft

c) What is the maximum height of the swimmer?

$x = \frac{-6}{2(-3)} = \frac{-6}{-6} = 1$

$-3(1)^2 + 6(1) + 24$

$-3 + 6 + 24$

27 ft

d) How long does it take for the swimmer to reach its maximum height?

1 sec