

Midterm Review

1.

- a. Linear absolute value
- b. Quadratic
- c. Exponential
- d. Linear

2.

- a. Decreasing
- b. Both
- c. Both
- d. Decreasing
- e. constant

3.

- a. minimum
- b. neither
- c. maximum
- d. neither
- e. minimum

4-5.

- I.
- a. Function
 - b. Discrete
 - c. Decreasing
 - d. Neither
 - e. Linear

- II a. Not
a function

- III
- a. Function
 - b. Continuous
 - c. Neither
 - d. Maximum
 - e. Quadratic

IV. a. Not a function

V. a. Function
b. continuous
c. Neither
d. Minimum
e. Absolute Value

b.

a.
 $-56 < 8(x+2)$ and $8(x+2) < 32$

$$-56 < 8x + 16$$

$$\begin{array}{r} -56 < 8x + 16 \\ -16 \quad -16 \\ \hline -72 < 8x \\ \div 8 \quad \div 8 \end{array}$$

$$\begin{array}{r} -72 < 8x \\ \div 8 \quad \div 8 \\ \hline -9 < x \end{array}$$

$$\begin{array}{r} -9 < x \\ x > -9 \end{array}$$

$$\begin{array}{r} 8x + 16 < 32 \\ -16 \quad -16 \\ \hline 8x < 16 \\ \div 8 \quad \div 8 \\ \hline x < 2 \end{array}$$

$$\begin{array}{r} 8x < 16 \\ \div 8 \quad \div 8 \\ \hline x < 2 \end{array}$$

$$x < 2$$

$$\boxed{x > -9 \text{ and } x < 2}$$
$$-9 < x < 2$$

b.
 $-11 \leq -11x$ and $-11x \leq 33$
 $\div -11 \quad \div -11$

Flip the sign!

$$15 > x$$

and

$$\begin{array}{r} -11x \leq 33 \\ \div -11 \quad \div -11 \\ \hline \end{array}$$

Flip the sign!

$$x \geq -3$$

$$\boxed{-3 \leq x < 15}$$

c.
 $25 < 3x - 11$ and $3x - 11 < 3$
 $+11 \quad +11$

$$\begin{array}{r} 36 < 3x \\ \div 3 \quad \div 3 \\ \hline 12 < x \end{array}$$

$$x > 12$$

$$\begin{array}{r} 3x - 11 < 3 \\ +11 \quad +11 \\ \hline 3x < 42 \\ \div 3 \quad \div 3 \\ \hline x < 14 \end{array}$$

$$\begin{array}{r} 3x < 42 \\ \div 3 \quad \div 3 \\ \hline x < 14 \end{array}$$

$$x < 14$$

$$\boxed{12 < x < 14}$$

d. $-14 < -2(x+3)$ and $-2(x+3) < 98$

$$\begin{array}{r} -14 < -2x - 6 \\ +6 \quad +6 \\ \hline -8 < -2x \end{array}$$

$$\div -2 \quad \div -2$$

Flip the sign!

$$4 > x$$

$$\begin{array}{r} -2x - 6 < 98 \\ +6 \quad +6 \\ \hline -2x < 104 \end{array}$$

$$\div -2 \quad \div -2$$

Flip the sign!

$$x > -52$$

$$\underline{x < 4 \text{ and } x > -52}$$

7.

a. $-x + 8 = 3x - 4$

$$\begin{array}{r} -x + 8 = 3x - 4 \\ -3x \quad -3x \\ \hline -4x + 8 = -4 \end{array}$$

$$\begin{array}{r} -4x + 8 = -4 \\ -8 \quad -8 \\ \hline -4x = -12 \end{array}$$

$$\div -4 \quad \div -4$$

$$x = 3$$

check: $x = 3$

$$-(3) + 8 = 3(3) - 4$$

$$-3 + 8 = 9 - 4$$

$$5 = 5$$

✓

b. $2(x+5) - 15 = 33$

$$2x + 10 - 15 = 33$$

$$\begin{array}{r} 2x - 5 = 33 \\ +5 \quad +5 \\ \hline 2x = 38 \end{array}$$

$$\div 2 \quad \div 2 \quad x = 19$$

check: $2(19+5) - 15 = 33$

$$2(24) - 15 = 33$$

$$48 - 15 = 33$$

✓

$$c. -4x + 11 = 8$$

$$\begin{array}{r} -11 \quad -11 \\ \hline -4x = -3 \\ \div -4 \quad \div -4 \\ \hline \end{array}$$

$$x = 3/4$$

$$x = .75$$

$$\text{Check: } -4(.75) + 11 = 8$$

$$-3 + 11 = 8$$

$$8 = 8$$

✓

$$d. 1(x + 14) - 12 = -20$$

$$x + 14 - 12 = -20$$

$$x + 2 = -20$$

$$\begin{array}{r} -2 \quad -2 \\ \hline \end{array}$$

$$x = -22$$

check:

$$1(-22 + 14) - 12 = -20$$

$$1(-8) - 12 = -20$$

$$-8 - 12 = -20$$

$$-20 = -20$$

✓

$$8 a. \begin{array}{cc} (-11, 17) & \text{and} & (12, 52) \\ x_1 & y_1 & x_2 & y_2 \end{array}$$

$$\frac{52 - 17}{12 - (-11)} = \frac{35}{23} = 1.5$$

$$b. \begin{array}{cc} (50, -780) & \text{and} & (300, -400) \\ x_1 & y_1 & x_2 & y_2 \end{array}$$

$$\frac{-400 - (-780)}{300 - 50} = \frac{380}{250} = 1.5$$

$$c. \begin{array}{cc} (-10, -5) & \text{and} & (-8, -21) \\ x_1 & y_1 & x_2 & y_2 \end{array}$$

$$\frac{-21 - (-5)}{-8 - (-10)} = \frac{-16}{2} = -8$$

$$d. \begin{array}{cc} (-23, 2) & \text{and} & (6, 25) \\ x_1 & y_1 & x_2 & y_2 \end{array}$$

$$\frac{25 - 2}{6 - (-23)} = \frac{23}{29} = .8$$

$$9. a. \begin{array}{r} |-x+8|+2=7 \\ -2 \quad -2 \\ \hline \end{array}$$

$$|-x+8| = 5$$

$$\begin{array}{r} -x+8=5 \\ -8 \quad -8 \\ \hline \end{array}$$

or

$$\begin{array}{r} -x+8=-5 \\ -8 \quad -8 \\ \hline \end{array}$$

$$\begin{array}{r} -x = -3 \\ \div -1 \quad \div -1 \\ \hline \end{array}$$

$$x = 3$$

$$\begin{array}{r} -x = -13 \\ \div -1 \quad \div -1 \\ \hline \end{array}$$

$$x = 13$$

check:

$$|-3+8|+2=7$$

$$|-3+8|+2=7$$

$$|5|+2=7$$

$$5+2=7 \quad \checkmark$$

$$|-13+8|+2=7$$

$$|-13+8|+2=7$$

$$|-5|+2=7$$

$$5+2=7 \quad \checkmark$$

$$b. \begin{array}{r} 2|x+5|-15=33 \\ +15 \quad +15 \\ \hline \end{array}$$

$$2|x+5| = 48$$

$$\div 2 \quad \div 2$$

$$|x+5| = 24$$

$$\begin{array}{r} x+5=24 \\ -5 \quad -5 \\ \hline \end{array}$$

or

$$\begin{array}{r} x+5=-24 \\ -5 \quad -5 \\ \hline \end{array}$$

$$x = -29$$

check:

$$2|19+5|-15=33$$

$$2|24|-15=33$$

$$48-15=33 \quad \checkmark$$

$$2|-29+5|-15=33$$

$$2|-24|-15=33$$

$$2(24)-15=33$$

$$48-15=33 \quad \checkmark$$

$$c. -3|4x+11| = 9$$

$$\div -3 \qquad \div -3$$

$$|4x+11| = -3$$

$$4x+11 = -3 \qquad \text{or}$$

$$-11 \quad -11$$

$$4x = -14$$

$$\div 4 \quad \div 4$$

$$x = -3.5$$

check:

$$-3|4(-3.5)+11| = 9$$

$$-3|-14+11| = 9$$

$$-3|-3| = 9$$

$$-3 \cdot 3 = 9$$

X Not True

No Solution

an absolute value expression can't equal a negative number:
 $|4x+11| = -3$

$$4x+11 = 3$$

$$-11 \quad -11$$

$$4x = -8$$

$$\div 4 \quad \div 4$$

$$x = -2$$

check:

$$-3|4(-2)+11| = 9$$

$$-3|-8+11| = 9$$

$$-3|3| = 9$$

$$-3 \cdot 3 = 9$$

X Not True

$$d. 5-6|x-9| = -19$$

$$-5 \qquad -5$$

$$-6|x-9| = -24$$

$$\div -6 \quad \div -6$$

$$|x-9| = 4$$

$$x-9 = 4 \qquad \text{or}$$

$$\begin{array}{c} \rightarrow 9 \quad +9 \\ x = 13 \end{array}$$

$$x-9 = -4$$

$$\begin{array}{c} +9 \quad +9 \\ x = 5 \end{array}$$

check:

$$5-6|13-9| = -19$$

$$5-6|4| = -19$$

$$5-24 = -19 \quad \checkmark$$

$$5-6|5-9| = -19$$

$$5-6|-4| = -19$$

$$5-6 \cdot 4 = -19$$

$$5-24 = -19 \quad \checkmark$$

10a.

$$d = -3 \quad a_1 = 8$$

$$a_n = 8 - 3(n-1)$$

$$a_n = a_{n-1} - 3$$

$$a_{25} = 8 - 3(25-1)$$

$$8 - 3(24)$$

$$8 - 72$$

$$a_{25} = -64$$

c. $d = 7 \quad a_1 = -11$

$$a_n = -11 + 7(n-1)$$

$$a_n = a_{n-1} + 7$$

$$a_{25} = -11 + 7(25-1)$$

$$= -11 + 168$$

$$a_{25} = 157$$

11.

a. $a_n = -11 + 5(n-1)$

$$= -11 + 5n - 5$$

$$= -16 + 5n$$

$$f(n) = 5n - 16$$

b.

$$g_1 = 3 \quad r = 1.5$$

$$g_n = 3(1.5)^{n-1}$$

$$g_n = g_{n-1} \cdot 1.5$$

$$g_{25} = 3(1.5)^{25-1}$$

$$g_{25} = 50,502.34$$

d. $g_1 = -6 \quad d = -3$

$$g_n = -6(-3)^{n-1}$$

$$g_n = g_{n-1} \cdot -3$$

$$g_{25} = -6(-3)^{25-1}$$

$$g_{25} = -1,694,577,218,886$$

b. $g_n = 5(-1/3)^{n-1}$

$$= 5 \cdot (-1/3)^n \cdot (-1/3)^{-1}$$

$$= 5(-1/3)^n \cdot (-3)$$

$$= -15(-1/3)^n$$

$$f(n) = -15(-1/3)^n$$

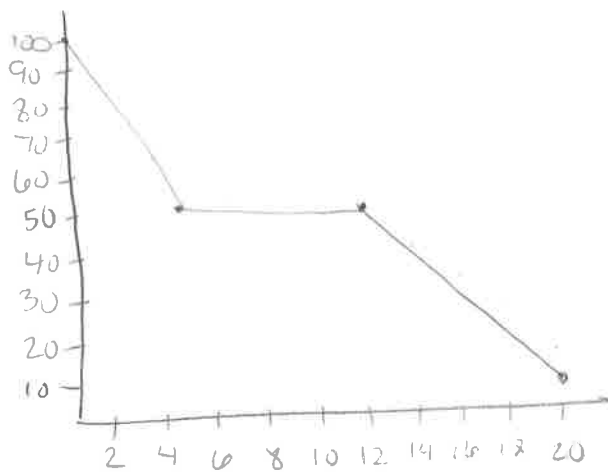
$$\begin{aligned}
 c. \quad g_n &= 2 \cdot 4^{n-1} \\
 &= 2 \cdot 4^1 \cdot 4^{-1} \\
 &= 2 \cdot 4^n \cdot (1/4) \\
 &= 2/4 \cdot 4^n
 \end{aligned}$$

$$f(n) = (1/2) \cdot 4^n$$

$$\begin{aligned}
 d. \quad a_n &= 27 - 3(n-1) \\
 &= 27 - 3n + 3 \\
 &= 30 - 3n
 \end{aligned}$$

$$f(n) = -3n + 30$$

12.



a. time in days

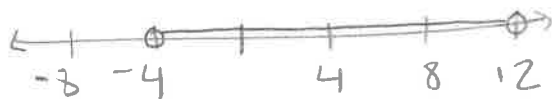
b. Money left

d. Linear Piecewise Function

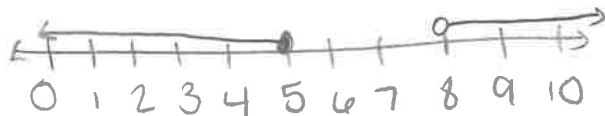
13.

$$27 \leq x \leq 37$$

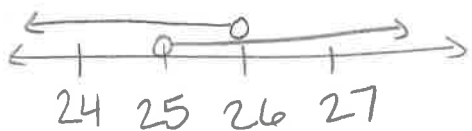
14. a.



b.

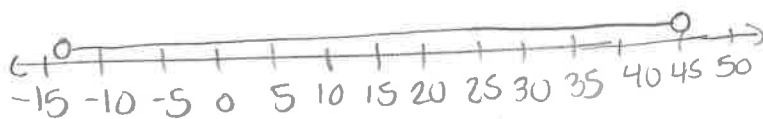


c.



All real numbers

d.



$$15. \quad A = 4 \cdot W$$

$$\div 4 \quad \div 4$$

$$\frac{A}{4} = W$$

$$W(A) = \frac{A}{4}$$

$$16. \quad D = \frac{56}{V}$$

$$D = \frac{56}{V} \times V$$

$$\times V \quad \times V$$

$$D \times V = 56$$

$$D \times V = 56$$

$$\div D \quad \div D$$

$$V = \frac{56}{D}$$

$$V(D) = \frac{56}{D}$$

17.

$$a. \quad f(-2) = 3(-2)^2 - 5(-2) + 9$$

$$3(4) - 5(-2) + 9$$

$$12 + 10 + 9$$

$$f(-2) = 31$$

$$c. \quad f(6) = 59 - 7(6)$$

$$= 59 - 42$$

$$f(6) = 17$$

$$b. \quad f(33) = \frac{1}{11}(33) + 2.5$$

$$= 3 + 2.5$$

$$f(33) = 5.5$$

$$d. \quad f(-23) = |-23 - 10|$$

$$= |-33|$$

$$f(-23) = 33$$

$$18. a. A = L \cdot W$$
$$\div W \quad \div W$$

$$\boxed{\frac{A}{W} = L}$$

$$b. A = \frac{1}{2} \cdot B \cdot H$$
$$\div \frac{1}{2} \quad \div \frac{1}{2}$$

$$\frac{A}{\frac{1}{2}} = B \cdot H$$

$$2A = B \cdot H$$
$$\div B \quad \div B$$

$$\boxed{\frac{2A}{B} = H}$$

$$c. S = \frac{d}{t} \cdot t$$
$$\cdot t$$

$$S \cdot t = d$$

$$\div S \quad \div S$$

$$\boxed{t = \frac{d}{S}}$$

$$19. f(l, s) = 21.6l + 16.5s$$

$$20. a. y = 14.8x + 8.1 \quad x = 121 \quad y = 1798.9$$

$$b. y = -0.019x + 55.6 \quad x = 3000 \quad y = 1.4$$

$$c. y = 51.8x - 141.28 \quad x = 6.9 \quad y = 216.14$$

21. a.

$$3x + 7y = 42$$

x-int, $y=0$

$$3x + 7(0) = 42$$

$$\frac{3x}{3} = \frac{42}{3}$$

$$x = 14$$

$$(14, 0)$$

y-int, $x=0$

$$3(0) + 7y = 42$$

$$\frac{7y}{7} = \frac{42}{7}$$

$$y = 6$$

$$(0, 6)$$

b. $y = -11x + 12$

Slope-intercept form shows the y-intercept.

$$(0, 12)$$

x-int, $y=0$

$$0 = -11x + 12 \quad \text{solve for } x$$

$$\frac{-12}{-11} = \frac{-11x}{-11} \quad x = 12/11 \quad (12/11, 0)$$

22. d. $r = -98$

23. $y = -2x + 12$ ← slope-int form, change to standard

$$\frac{+2x \quad +2x}{2x + y = 12} \quad \leftarrow \text{standard form}$$

$$4x - 5y = 100 \quad \leftarrow \text{standard form, change to slope-int by solving for } y$$

$$\frac{-5y}{-5} = \frac{100 - 4x}{-5} \quad y = -20 + 4/5x$$

24. a. $x=7$ b. $f(3)=5$ c. $f(5)=9$

25. a. $g(6) = -25(6) + 52$
 $g(6) = -98$

c. $g(-11) = -25(-11) + 52$
 $g(-11) = 327$

b. $200 = -25x + 52$
 $-52 \quad -52$

 $148 = -25x$
 $-25 \quad -25$
 $-5.92 = x$