DYLAN ZWICK'S MATH 1010 CLASS

2.5 Absolute Value Equations and Inequalities

Determine whether the value is a solution of the equation:

2.5.1: |4x+5| = 10, x = -3 **2.5.4:** $|\frac{1}{2}t+4| = 8, t = 6$

2.5.2: |2x - 16| = 10, x = 3

Transform the absolute value equation into two linear equations:

2.5.5: |x - 10| = 17 **2.5.8:** |22k + 6| = 9

2.5.7:
$$|4x+1| = \frac{1}{2}$$

Write the absolute value equations in standard form:

2.5.9:
$$|3x| + 7 = 8$$
 2.5.11: $3|2x| - 1 = 5$

Date: Due Wednesday, September 23th.

Solve the equations:

2.5.13:
$$|x| = 4$$
 2.5.27: $|5x - 3| + 8 = 22$

2.5.16:
$$|s| = 16$$

2.5.28: $|5 - 2x| + 10 = 6$

2.5.17:
$$|h| = 0$$

2.5.30: $\left|\frac{x-2}{5}\right| + 4 = 4$

2.5.18: |x| = -82

2.5.32: 4|5x+1| = 24

2.5.20:
$$\left|\frac{1}{3}x\right| = 2$$

2.5.34: 2|4-3x|-6=-2

2.5.21: |x+1| = 5

2.5.35:
$$|x+8| = |2x+1|$$

2.5.24:
$$\left|\frac{7a+6}{4}\right| = 2$$

2.5.37: |3x + 1| = |3x - 3|

2.5.26: |3x - 2| = -5

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2.5.40:
$$3|2-3x| = |9x+21|$$

Write an absolute value equation that represents the verbal statement:

2.5.42: The distance between -3 and t is 5.

Determine whether the *x*-value is a solution of the equality:

2.5.43: |x| < 3, x = 2 **2.5.46:** |x - 3| > 5, x = 16

2.5.45: $|x - 7| \ge 3, x = 9$

Transform the absolute value inequality into a double inequality or two separate inequalities:

2.5.47:
$$|y+5| < 3$$
 2.5.50: $|8-x| > 25$

Solve the inequality:

2.5.51:
$$|y| < 4$$
 2.5.59: $|x+6| > 10$

2.5.53:
$$|x| \ge 6$$
 2.5.62: $|6t + 15| \ge 30$

2.5.56: $|4z| \le 9$

2.5.65:
$$\frac{|y-16|}{4} < 30$$
 2.5.69: $\frac{|3x-2|}{4} + 5 \ge 5$

2.5.67:
$$|0.2x - 3| < 4$$

2.5.81: Write an absolute value inequality that represents the interval:



Write an absolute value inequality that represents the verbal statement:

2.5.85: The set of all real numbers x whose distance from 0 is less than 3.

2.5.88: The set of all real numbers x for which the distance from 0 to 5 more than half of x is less than 13.

2.5.89: Speed Skating In the 2006 Winter Olympics, each skater in the 500-meter short track speed skating final had a time that satisfied the inequality $|t - 42.238| \le 0.412$, where t is the time in seconds. Sketch the graph of the solution of the inequality. What are the fastest and slowest times?

- **2.5.91:** Accuracy of Measurements In woodshop class, you must cut several pieces of wood to within3/16inch of the teacher's specifications. Let (s x) represent the difference between the specification s and the measured length x of a cut piece.
 - (a) Write an absolute value inequality that describes the values of x that are within specifications.
 - (b) The length of one piece of wood is specified to be $s = 5\frac{1}{8}$ inches. Describe the acceptable lengths for this piece.

3.1 The Rectangular Coordinate System

Plot the points on a rectangular coordinate system:

3.1.1:
$$(4,3), (-5,3), (3,-5)$$

3.1.5: $(\frac{5}{2},-2), (-2,\frac{1}{4}), (\frac{3}{2},-\frac{7}{2})$

3.1.3: (-8, -2), (6, -2), (5, 0)

3.1.9: Determine the coordinates of the points:





3.1.12: Determine the coordinates of the points:

Plot the points and connect them with line segments to form the figure: **3.1.13:** Square: (2, 4), (5, 1), (2, -2), (-1, 1)

3.1.16: Triangle: (-1, 3), (-2, -2), (3, 8)

3.1.20: Rhombus: (-3, -3), (-2, -1), (-1, -2), (0, 0)

Find the coordinates of the point:

- **3.1.21:** The point is located one unit to the right of the *y*-axis and four units above the *x*-axis.
- **3.1.25:** The point is on the positive *x*-axis 10 units from the origin.
- **3.1.27:** The coordinates of the point are equal, and the point is located in the third quadrant eight units to the left of the *y*-axis.

Determine the quadrant in which the point is located without plotting it.(x and y are real numbers)

3.1.29: (-3, -5)	3.1.38: (<i>x</i> , -6)
3.1.33: (-9.5, -12.13)	3.1.41: $(x, y), xy > 0$

Sketch a scatter plot of the points whose coordinates are shown in the table:

3.1.43: *Exam Scores* The table shows the time x in hours invested in studying for five different algebra exams and the resulting score y.

x	5	2	3	6.5	4
y	81	71	88	92	86

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3.1.44: Net Sales The net sales y (in billions of dollars) of Wal-Mart for the years 2003 through 2007 are shown in the table. The time in years is given by x. (Source: Wal-Mart 2007 Annual Report)

ſ	x	2003	2004	2005	2006	2007
	y	226.5	252.8	281.5	308.9	345.0

3.1.46: *Fuel Efficiency* The table shows various speeds x of a car in miles per hour and the corresponding approximate fuel efficiencies y in miles per gallon.

x	50	55	60	65	70
y	35	33.8	32.2	30	27.5



3.1.48: The figure is shifted to a new location in the plane. Find the coordinates of the vertices of the figure in its new location.

Complete the table of values. Then plot the solution points on a rectangular coordinate system.

3.1.49:	x	-2	0	2	4	6
J.1.4J.	y = 5x + 3					

3.1.50:	x	-3	0	3	6	9
J.1.JU.	y = 6x - 7					

3159.	x	-5	-1	0	3	8
J.1.J <i>2</i> .	y = -3x + 1 - 5					

Determine whether each ordered pair is a solution of the equation:

3.1.55: 4y - 2x + 1 = 0(a) (0,0)(b) $(\frac{1}{2},0)$ **3.1.60:** $y^2 - 4x = 8$ (a) (0,6)(b) (-4,2)(c) (-1,3)(d) (7,6) Plot the points and find the distance between them. State whether the points lie on a horizon or a vertical line.

3.1.61:
$$(3, -2), (3, 5)$$

3.1.66: $(\frac{3}{4}, 1), (\frac{3}{4}, -10)$

Find the distance between the points.

3.1.69:
$$(1,3), (5,6)$$
 3.1.74: $(0,-5), (2,-8)$



3.1.79: Show that the points are vertices of a right triangle.

Use the Distance Formula to determine whether the three points are collinear.

3.1.83: (2,3), (2,6), (6,3) **3.1.86:** (2,4), (1,1), (0,-2)

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3.1.93: Numerical Interpretation For a handyman to install x windows in your home, the cost y is given by y = 150x + 425. Use x-values of 1, 2, 3, 4, and 5 to help describe the relationship between the number of windows x and the cost of installation y.

3.1.95: Football Pass A football quarterback throws a pass from the 10-yard line, 10 yards from the sideline. The pass is caught by a wide receiver on the 40-yard line, 35 yards from the same sideline, as shown in the figure. How long is the pass?



3.2 Graphs of Equations

Match the equation with the label of its graph.



3.2.1: $y = 2$	3.2.4: $y = x^2$
3.2.2: $y = 2 + x$	3.2.5: $y = x^2 - 4$
3.2.3: $y = 2 - x$	3.2.6: $y = x $

Sketch the graph of the equations.

3.2.7:
$$y = 3x$$
 3.2.14: $2y + 5x = 6$

3.2.9:
$$y = 4 - x$$
 3.2.15: $y = -x^2$

3.2.10:
$$y = x - 7$$
 3.2.18: $y = 4 - x^2$

3.2.11:
$$2x - y = 3$$
 3.2.19: $-x^2 - 3x + y = 0$

3.2.20:
$$-x^2 + x + y = 0$$
 3.2.25: $y = |x| + 3$

3.2.21:
$$x^2 - 2x - y = 1$$
 3.2.27: $y = |x + 3|$

3.2.22:
$$x^2 + 3x - y = 4$$
 3.2.30: $y = -x^3$

Find the x-and y-intercepts(if any) of the graph of the equation.

3.2.31:
$$y = 6x - 3$$
 3.2.37: $4x - y + 3 = 0$

3.2.34:
$$y = \frac{3}{4}x + 15$$
 3.2.40: $y = |x| + 4$

3.2.42:
$$y = |x - 4|$$

Sketch the graph of the equation and show the coordinates of three solution points (including x- and y- intercepts).

3.2.57:
$$y = 3 - x$$
 3.2.69: $5x - y = 10$

3.2.60:
$$y = -4x + 8$$
 3.2.72: $y = x^2 - 16$

3.2.62:
$$y - 2x = -4$$
 3.2.76: $y = 1 + x^2$

3.2.65:
$$3x + 4y = 12$$
 3.2.80: $y = x(x+2)$

3.2.86: y = |x| + 4

3.2.92:
$$y = |x| + |x - 2|$$

3.2.93: Straight-Line Depreciation A manufacturing plant purchases a new molding machine for \$230,000. The depreciated value y after t years is given by

 $y = 230,000 - 25,000t, 0 \le t \le 8.$

Sketch a graph of this model.

- **3.2.95:** Straight-Line Depreciation Your company purchases a new delivery van for \$40,000. For tax purposes, the van will be depreciated over a seven-year period. At the end of the 7 years, the value of the van is expected to be \$5000.
 - (a) Find an equation that relates the depreciated value of the van to the number of years since it was purcharsed.
 - (b) Sketch the graph of the equation.

- (c) What is the *y* intercept of the graph and what does it represent?
- **3.2.97:** *Hooke's Law* The force F(in pounds) required to stretch a spring x inches from its natural length is given by

$$F = \frac{4}{3}x, \quad 0 \le x \le 12.$$

(a) Use the model to complete the table.

x	0	3	6	9	12
F					

(b) Sketch a graph of the model.

- (c) Determine the required change in F if x is doubled.Explain your reasoning.
- **3.2.100:** *Exploration* Graph the equations $y = x^2 + 1$ and $y = -(x^2 + 1)$ on the same set of coordinate axes. Explain how the graph of an equation changes when the expression for y is multiplied by -1. Justify your answer by giving additional examples.