Unit 1 -Functions and Their Graphs

Section 1.1

Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

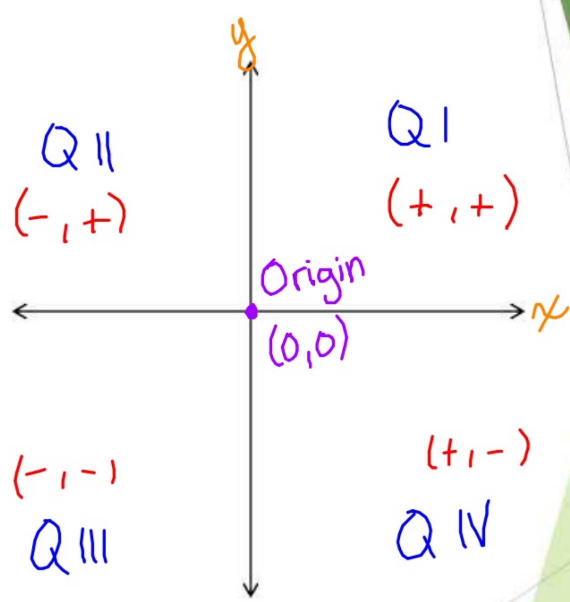
Midpoint Formula

$$Midpoint = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

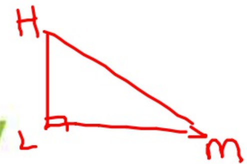
Coordinate Plane

Name:

1. 4 Quadrants
2. x and y-axis
3. positive and negative in quad
4. origin



$m = \frac{y_2 - y_1}{x_2 - x_1}$



Coordinate Geometry

1. If ΔHLM has vertices H(-3, 2), L (2, 1) and M (3, 6).

   Show that the triangle is a right, isosceles triangle.

$m_{HL} = \frac{1-2}{2--3} = \frac{-1}{5}$ ✓

$m_{LM} = \frac{6-1}{3-2} = \frac{5}{1}$

Right ∠ @ point L

$HL = \sqrt{(-3-2)^2 + (2-1)^2}$

$= \sqrt{(-5)^2 + (1)^2}$

$\boxed{HL = \sqrt{26}}$ ✓

$LM = \sqrt{(2-3)^2 + (1-6)^2}$

$= \sqrt{(-1)^2 + (-5)^2}$

$\boxed{LM = \sqrt{26}}$ ✓

2. If Quad ABCD has vertices A (-3, -1), B (-6, 2), C (-2, 6), and D (1, 3), show the diagonals bisect each other and are congruent. What is the most specific name for quad ABCD?

Midpt of $\overline{AC}$

$\left(\frac{-3+-2}{2}, \frac{-1+6}{2}\right)$

$\left(-\frac{5}{2}, \frac{5}{2}\right)$

Midpt of $\overline{BD}$

$\left(\frac{-6+1}{2}, \frac{2+3}{2}\right)$

$\left(-\frac{5}{2}, \frac{5}{2}\right)$ ✓ → Diagonals bisect

$AC = \sqrt{(-3--2)^2 + (-1-6)^2}$

$= \sqrt{(-1)^2 + (-7)^2}$

$= \sqrt{50} = \boxed{5\sqrt{2}}$

Diagonals ≅

$BD = \sqrt{(-6-1)^2 + (2-3)^2}$

$= \sqrt{(-7)^2 + (-1)^2}$

$= \sqrt{50} = \boxed{5\sqrt{2}}$ ✓

$m_{AC} = \frac{6--1}{-2--3} = \frac{7}{1}$

$m_{BD} = \frac{3-2}{1--6} = \frac{1}{7}$

not opp. rec. → not rhombus/square → Rectangle

- diagonals ≅

Section 1.2

Write a linear equation given the following information.

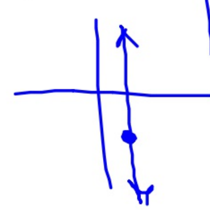
1. $m = \frac{1}{2}$ and b = -1

$y = \frac{1}{2}x - 1$

2. m = undefined and through (1, -2)

$\cancel{y = \nabla x + b}$

Vertical Line



$\boxed{x = 1}$

3. through the point (-1, 3) and m = $\frac{1}{2}$

x y

$y = mx + b$

$3 = \frac{1}{2}(-1) + b$

$3 = -\frac{1}{2} + b$

$3\frac{1}{2} = b$

$\frac{7}{2} = b$

$\boxed{y = \frac{1}{2}x + \frac{7}{2}}$

Point-slope Form:

$y - y_1 = m(x - x_1)$

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

$y - 3 = \frac{1}{2}x + \frac{1}{2}$

$\boxed{y = \frac{1}{2}x + \frac{7}{2}}$

4. through the points (5, 1) and (2, 7)

$$m = \frac{7-1}{2-5} = \frac{6}{-3} = -2$$

$y = mx + b$

$1 = -2(5) + b$

$1 = -10 + b$

$11 = b$

$$\boxed{y = -2x + 11}$$

5. x-intercept of 3 and a y-intercept of -2

$(3, 0)$ $\underbrace{(0, -2)}_{b}$

$m = \frac{0 - -2}{3 - 0} = \frac{2}{3}$

$\boxed{y = \frac{2}{3}x - 2}$

6. y-intercept of -1 and ⊥ to 3x - 2y = 4

$$3x - 2y = 4$$
$$-3x \qquad -3x$$
$$\frac{-2y}{-2} = \frac{-3x+4}{-2}$$
$$y = \frac{3}{2}x - 2$$

$$m_{\perp} = -\frac{2}{3}$$

$$\boxed{y = -\frac{2}{3}x - 1}$$

Standard form

$$Ax + By = C$$
$$m = -\frac{a}{b}$$
$$m = \frac{-3}{-2} = \frac{3}{2}$$

7. through (1, -4) and || to 2x - y = 4

parallel

$m_{\parallel} = 2$

$m = -\frac{a}{b}$

$m = -\frac{2}{-1} = 2$

$y = mx + b$

$-4 = 2(1) + b$

$-2 \quad -2$

$-6 = b$

$\boxed{y = 2x - 6}$

Point-Slope

$y - y_1 = m(x - x_1)$

$y - -4 = 2(x - 1)$

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

$y + 4 = 2x - 2$

$-4 \quad -4$

$\boxed{y = 2x - 6}$

8. the perpendicular bisector of the segment joining the points (7, 0) and (1, 8)

→ MIDPT

MIDPOINT: $\left(\frac{7+1}{2}, \frac{0+8}{2}\right) = \boxed{(4,4)}$

Slope: $\frac{8-0}{1-7} = \frac{8}{-6} = \frac{-4}{3} \rightarrow \boxed{m_{\perp} = \frac{3}{4}}$

$y = mx + b$

$4 = \frac{3}{4}(4) + b$

$4 = 3 + b$

$1 = b$

$\boxed{y = \frac{3}{4}x + 1}$

9. A triangle is located at the vertices R $\boxed{(2, 2)}$, S (5, 5), and T (7, 1).

A. Find the equation of the median from R.

MIDPT OF $\overline{ST} = \left(\frac{5+7}{2}, \frac{5+1}{2}\right) = \boxed{(6, 3)}$

$m = \frac{3-2}{6-2} = \frac{1}{4}$

$y = mx + b$

$2 = \frac{1}{4}(2) + b$

$2 = \frac{1}{2} + b$ $\quad b = \frac{3}{2}$

$\boxed{y = \frac{1}{4}x + \frac{3}{2}}$

B. Find the equation of the altitude from T.

$m_{RS} = \frac{5-2}{5-2} = 1$ $\quad$ T: (7, 1)

$\boxed{m_{\perp} = -1}$

$y = mx + b$

$1 = -1(7) + b$

$8 = b$

$\boxed{y = -x + 8}$

10. A triangle has the vertices A(-3, 2), B(-2, -1), and

C(4, 1).

A. Find the equation of the median from A.

MIDPT $\overline{BC}$: $\left(\frac{-2+4}{2}, \frac{-1+1}{2}\right) = \boxed{(1, 0)}$ $\boxed{A: (-3, 2)}$

$m = \frac{2-0}{-3-1} = \frac{2}{-4} = -\frac{1}{2}$

$y = mx + b$

$0 = -\frac{1}{2}(1) + b$

$\frac{1}{2} = b$

$\boxed{y = -\frac{1}{2}x + \frac{1}{2}}$

B. Find the equation of the altitude from C.

$m_{AB} = \frac{2 - -1}{-3 - -2} = \frac{3}{-1} = -3$

$m_{\perp} = \frac{1}{3}$

$C: (4, 1)$

$y = mx + b$

$1 = \frac{1}{3}(4) + b$

$1 = \frac{4}{3} + b$

$-4/3$

$-\frac{1}{3} = b$

$\boxed{y = \frac{1}{3}x - \frac{1}{3}}$

Section 1.3

Linear Equations

Slope intercept form

$$y = mx + b$$

Standard form

$$\boxed{Ax + By = C} \text{ or } \cancel{Ax + By + C = 0}$$

$m = \frac{-A}{B}$ $b = \frac{C}{B}$

x-intercepts always (#, 0)

y-intercepts always (0, #)

Important shapes to know

Parabola

$$y = (x-h)^2 + k$$

Vertex: (h, k)

Circle

$$(x-h)^2 + (y-k)^2 = r^2$$

Center: (h, k)   radius = r

The point (-3, -5) lies on a circle whose center is (1, -2). Find the equation of the circle in standard form.

Center: $(1, -2)$

$h \quad k$

Equation

$(x-1)^2 + (y+2)^2 = 25$

(r^2)

Dist: $\sqrt{(-3-1)^2 + (-5--2)^2}$

$= \sqrt{(-4)^2 + (-3)^2}$

$= \sqrt{16+9}$

$= \sqrt{25}$

$= 5 \rightarrow r = 5$

p9. #11-20, 24, 26, (32-38 evens), 41, 42

p.22 #7, (10-20 evens), (33, 34, 35 graph only), 59, 62, 67

p.36 #89, 90

p.39 #129-132