# INTERMEDIATE ALGEBRA

GPS #6 2.1 FUNCTIONS AND THEIR REPRESENTATIONS NAME: Kelly Fenton

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**Useful Definitions:**

* A relation is a set of ordered pairs. For example: $\{(-1,4),(-3,5),(1,2),(7,-2)\}$
* A function is a relation in which, for each value of the first component of the ordered pairs, there is exactly one value of the second component.
* In a relation, the set of all values of the independent variable is the domain; the set of all values of the dependent variable is the range. x y
* Vertical Line Test: If every vertical line intersects the graph of a relation only once, the relation is a function.

function:

| x | y |
|---|---|
| -1 | 4 |
| -3 | 5 |
| 1 | 2 |
| 7 | -2 |

1. State whether each relation defines a function and give the domain and range.

a) $\{(-1,4),(-3,5),(1,2),(7,-2)\}$

| | |
|---|---|
| -1 | 4 |
| -3 | 5 |
| 1 | 2 |
| 7 | -2 |

= function

domain: {-1, -3, 1, 7} – must use squigly line
Range: {4, 5, 2, -2}

b) $\{(2,7),(3,-4),(2,0),(1,-2)\}$

2 ↔ 7
3 ↔ -4
2 → 0
1 ↔ -2

= not a function

domain: {2, 3, 1}
range: {7, -4, 0, -2}

2. Use "vertical line test" to check whether each relation defines $y$ as a function of $x$. Give the domain.

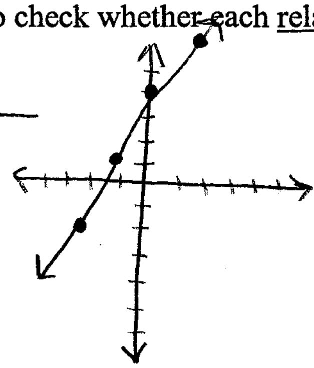
a) $y=3x+4$

y = f(x)

function

y is a function of x

| x | y |
|---|---|
| 0 | 4 |
| 1 | 7 |
| -1 | 1 |
| -2 | -2 |

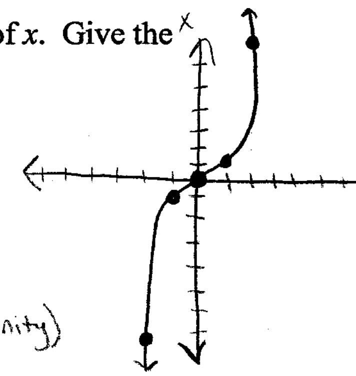


b) $y=x^3$

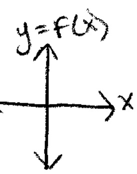
cubic function

non-linear function

| x | y |
|---|---|
| 0 | 0 |
| 1 | 1 |
| -1 | -1 |
| 2 | 8 |
| -2 | -8 |



domain: ∞ (infinity)
D: $(-\infty, +\infty)$
R: $(-\infty, +\infty)$

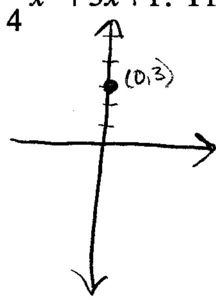



3. Let $f(x)=-2x+3$ and $g(x)=-\frac{1}{4}x^2+3x+1$. Find the following.

y = f(x)

a) $f(1)=$ $-2(1)+3=1$

b) $g(-2)=$ $-\frac{1}{4}(-2)^2+3(-2)+1$
$-\frac{1}{4}(4)-6+1=-6$




c) $f(m)=$ $-2(m)+3=-2m+3$

d) $g(-x)=$ $-\frac{1}{4}(-x)^2+3(-x)+1$

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

e) $g(-k)=$ $-\frac{1}{4}x^2-3x+1$
$-\frac{1}{4}(-k)^2+3(-k)+1$
$-\frac{1}{4}k^2-3k+1$

4. For each function, find $f(1)$ and $f(-2)$.

a) $f=\{(-2,4),(3,6),(1,0),(7,2)\}$

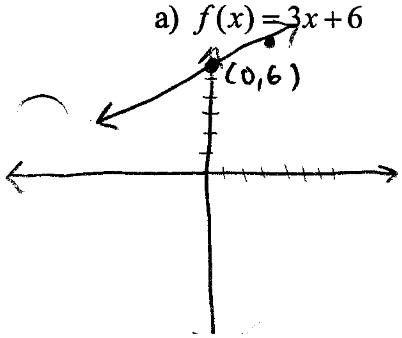
f(1) = 0
f(-2) = 4

b) $f=\{(1,2),(-3,0),(-2,9),(4,2)\}$

5. Graph each linear function. Give the domain and range. Label the function and the points.

a) $f(x)=3x+6$

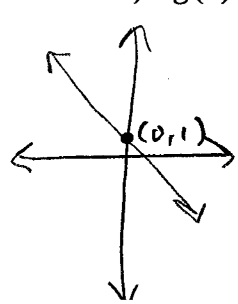
| x | y |
|---|---|
| 0 | 6 |
| 1 | 9 |




D: $(-\infty, +\infty)$
R: $(-\infty, +\infty)$

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

| x | y |
|---|---|
| 0 | 1 |
| 1 | $-1\frac{1}{2}$ |




D: $(-\infty, +\infty)$
R: $(-\infty, +\infty)$

## INTERMEDIATE ALGEBRA

**GPS # 7** **2.2 LINEAR FUNCTIONS** **NAME:** Kelly Fenton

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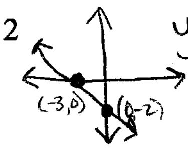
**Useful Guidelines:**

* Linear Function: $f(x) = ax + b$ [Example: $f(x) = 4x - 3$, $a = 4$ and $b = -3$]
  Its graph is a straight line. For each unit increase in $x$, $f(x)$ changes by an amount equal to $a$.
* Rate of Change for a Linear Function: The output of a linear function changes by a constant amount for each unit increase in the input.
* When data have a constant rate of change, they can be modeled by $f(x) = ax + b$. The constant $a$ represents the rate of change, and the constant $b$ represents the initial amount or the value when $x = 0$.

1. Determine whether $f$ is a linear function. If $f$ is linear, give values for $a$ and $b$ so that $f$ may be expressed as $f(x) = ax + b$.

a) $f(x) = -3x - 2$ yes=linear

$a = -3$
$b = -2$




b) $f(x) = x^2 - 2$ not linear

c) $f(x) = 50$

$a = 0$
$b = 50$ yes=linear

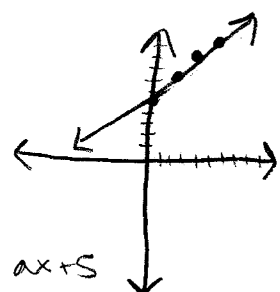
d) $f(x) = \sqrt{x} + 4$

$F(x) = x^{\frac{1}{2}} + 4$ not linear

2. Use the table to determine whether $f(x)$ could represent a linear function. If it could, write the formula for $f$ in the form $f(x) = ax + b$.

a)

| $x$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| $f(x)$ | 5 | 7 | 9 | 11 |



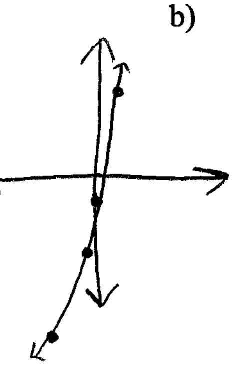
yes=linear

$f(x) = ax + b$
$5 = 0 + b$
$b = 5$
$f(x) = ax + 5$

$F(x) = ax + 5$
$7 = a(1) + 5$
$7 = a + 5$
$a = 2$

$\boxed{f(x) = 2x + 5}$

b)



| $x$ | -2 | -1 | 0 | 1 |
|---|---|---|---|---|
| $f(x)$ | -20 | -11 | -2 | 7 |

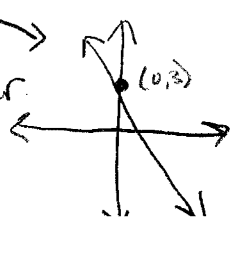
$f(x) = ax + b$
$-2 = 0 + b$
$b = -2$
$f(x) = ax - 2$

$f(x) = ax + b$
$7 = a(1) - 2$
$7 = a - 2$
$a = 9$

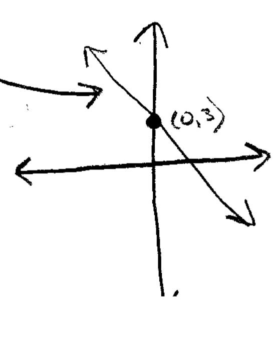
$\boxed{f(x) = 9x - 2}$

3. Evaluate $f(x)$ at $x = 0$ and $x = -3$ for the following:

a) $f(x) = -3x + 3$
yes=linear
$f(0) = 3$
$f(-3) = 12$




b) $f(x) = -\frac{1}{3}x + 3$
yes=linear



# INTERMEDIATE ALGEBRA

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**GPS # 8** **2.3 THE SLOPE OF A LINE** **NAME:** Kelly Fenton

**Useful Guidelines:**

* The slope of a line through the points $(x_1, y_1)$ and $(x_2, y_2)$ is $(1,9)(8,18)$

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{rise}{run}$ $(x_1 \neq x_2)$. **"Slope Formula"**

* The slope-intercept form of the equation of a line with slope $m$ and $y$-intercept $b$ is $y = mx + b$

Positive

negative

$\frac{19}{20}$

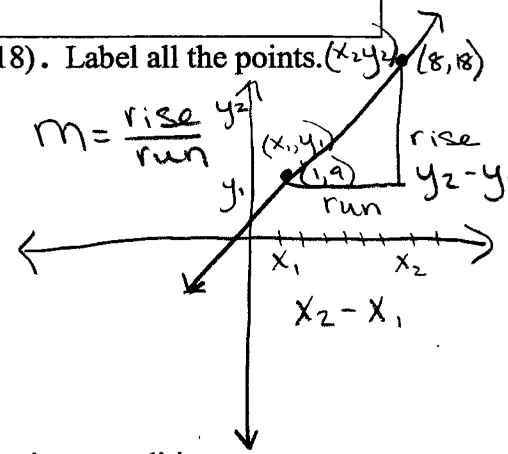
1. Graph and find the slope of a line through the points $(1,9)$ and $(8,18)$. Label all the points. Find an equation of the line containing the given pair of points.

$m\text{ (slope)} = \dfrac{y_2 - y_1}{x_2 - x_1}$

$= \dfrac{18-9}{8-1}$

$m = \dfrac{9}{7}$

$m = \dfrac{rise}{run}$

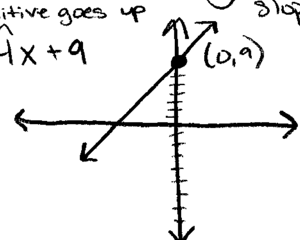



2. Find the equation in slope-intercept form of the line satisfying the given conditions.

a) slope 4; $y$-intercept (0,9) $y = mx + b$ (slope, intercept)

$m = 4$ positive goes up

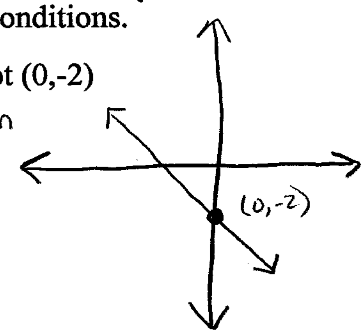
$b = 9$ $y = 4x + 9$




b) slope $-\dfrac{7}{4}$; $y$-intercept (0,-2)

negative goes down

$y = -\frac{7}{4}x - 2$




3. For each equation, write it in slope-intercept form, give the slope of the line, give the $y$-intercept, and graph the line. Label the line and all the points. $y = mx + b$

a) $-x + 2y = 8$ (Solve for y)

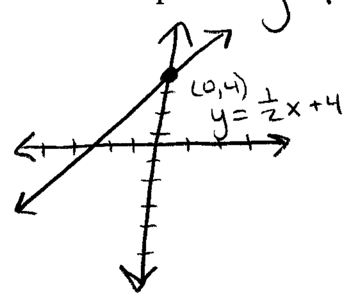
$\frac{2y}{2} = \frac{x+8}{2}$

$y = \frac{x}{2} + \frac{8}{2}$

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

(slope) $m = \frac{1}{2}$

y-int $= (0,4)$




| x | y |
|---|---|
| 0 | 4 |
| 2 | 5 |
| 4 | 6 |

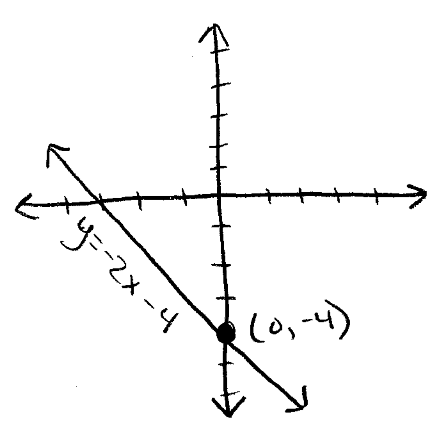
b) $3y + 6x = -12$

$\frac{3y}{3} = \frac{-6x - 12}{3}$

$y = -2x - 4$

(slope) $m = -2$

y-int. $= (0,-4)$




| x | y |
|---|---|
| 0 | -4 |
| 2 | -8 |
| 4 | -12 |

# INTERMEDIATE ALGEBRA

**GPS # 9** **2.4 EQUATIONS OF LINES AND LINEAR MODELS** **NAME:** Kelly Fenton

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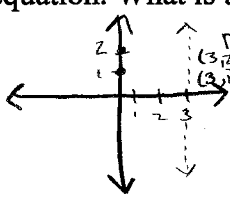
**Useful Guidelines:**

* The slope-intercept form of the equation of a line with slope $m$ and $y$-intercept $b$ is
  $y = \underbrace{m}_{\text{slope}}x + \underbrace{b}_{\text{y int.}}$
* The point-slope form of the equation of a line with slope $m$ passing through the point $(x_1, y_1)$ is
  $y - y_1 = m(x - x_1)$
* The standard form of the equation of a line: $ax + by = c$
* Two lines with the same slope are parallel: $m_1 = m_2$
* Two lines with nonzero slopes $m_1$ and $m_2$ are perpendicular when $m_1 \cdot m_2 = -1$ or $m_2 = -\frac{1}{m_1}$.

point
slope

1. Graph the equation. What is the slope?

a) $x = 3$



$m$ = undefined

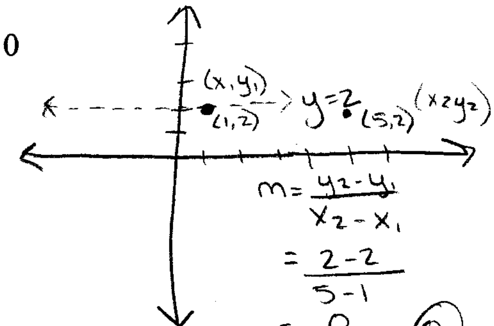
$m = \frac{y_2 - y_1}{x_2 - x_1}$

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

$= \frac{1}{0}$ - undef.

b) $y - 2 = 0$

$y = 2$



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

$= \frac{2-2}{5-1}$

$= \frac{0}{4} = 0$

2. Does the point (2,48) lie on the line $y = 20x + 8$?

Plug in

$48 = 20(2) + 8 = 48$ yes

3. Using the point-slope form to find an equation of the line that satisfies the given conditions. Write the equation in slope-intercept form and in standard form.

a) Through (6, 1); slope $-\frac{1}{3}$

$(x_1, y_1)$ $m = -\frac{1}{3}$

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

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

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

$y = -\frac{1}{3}x + 3$ (slope int. form)

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

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

$3y + x = 9$ (standard form)

b) Through (-3,-2); slope $-\frac{4}{3}$

$x_1, y_1$ $m = -\frac{4}{3}$

$y - (-2) = -\frac{4}{3}(x - (-3))$

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

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

* $y = -\frac{4}{3}x - 6$ (slope int. form)

$y + \frac{4}{3}x = -6$

$3(y + \frac{4}{3}x) = -6(3)$

* $3y + 4x = -18$ (standard form)

3. Find an equation of the line passing through the point (-2, 4) and

$x_1$ $y_1$

a) parallel to the line $3x + 5y = 10$

b) perpendicular to the line $3x + 5y = 10$

[Write each equation in slope-intercept form.]

Solve for y

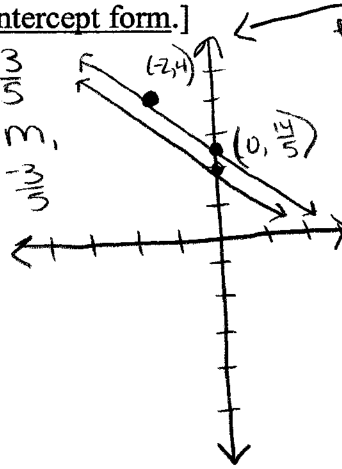
$\frac{5y}{5} = \frac{-3x}{5} + \frac{10}{5}$

$y = \underbrace{-\frac{3}{5}}_{\text{slope}}x + 2$

$m_1 = -\frac{3}{5}$

$m_2 = m_1$

$m_2 = -\frac{3}{5}$



1 point
1 slope

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

$y - 4 = -\frac{3}{5}(x + 2)$

$y - 4 = -\frac{3}{5}x - \frac{6}{5}$

$y = -\frac{3}{5}x - \frac{6}{5} + 4 \cdot \frac{5}{5} = \frac{20}{5}$

$y = -\frac{3}{5}x + \frac{14}{5}$ slope int. form

Flip $m_2 = \frac{5}{3}$

$(x_1, y_1) = (-2, 4)$

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

$y - 4 = \frac{5}{3}(x + 2)$

$y - 4 = \frac{5}{3}x + \frac{10}{3}$

$y = \frac{5}{3}x + \frac{10}{3} + 4 \cdot \frac{3}{3}$

$y = \frac{5}{3}x + \frac{10}{3} + \frac{12}{3}$

$y = \frac{5}{3}x + \frac{22}{3}$ slope int. form