

# 1.1 and 1.2 Lines, Functions, and Graphs

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## Slope

$$m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

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## Parallel and Perpendicular Lines

Parallel lines have the same slope, and perpendicular lines have negative reciprocal slopes

( $m$  and  $m$  for parallel,  $m$  and  $-\frac{1}{m}$  for perpendicular).

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## Equations of Lines

Point – Slope Form  $\rightarrow y - y_1 = m(x - x_1)$

Slope – Intercept Form  $\rightarrow y = mx + b$

General (or Standard) Form  $\rightarrow Ax + By = C$  (where  $A$ ,  $B$ , and  $C$  are integers, if possible)

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For problems 1 – 3, find the equation of the line in the indicated form.

1. through  $(-2, 3)$  and  $(4, -2)$  in Point – Slope form

2. through  $(-1, -3)$  and  $(4, -3)$  in General form

3. through  $(-5, 1)$  and  $(0, 4)$  in Slope – Intercept form

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For problems 4 and 5, find (a) the slope, and (b) the  $y$  – intercept, and (c) graph the line.

4.  $2x + 3y = 6$

5.  $y - 2 = -(x + 3)$

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6. Find the equation of the line through the point  $(2, 1)$  and perpendicular to the line  $x + 2y = 7$

7. Find the equation of the line in Slope – Intercept form that passes through the points  $(3, 1)$ ,  $(9, -1)$ , and  $\left(-2, \frac{8}{3}\right)$

8. Find  $y$  if the line through  $(-3, y)$  and  $(1, -2)$  has slope  $\frac{-3}{4}$

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### Function Definition

A function from a set  $D$  to a set  $R$  is a rule that assigns a *unique* element in  $R$  to each element in  $D$ . For example if the points  $(1, 2)$  and  $(1, 5)$  are in the set, then it is not a function.

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### Even and Odd Functions

Even:  $f(x) = f(-x)$  (symmetry with respect to the  $y$  – axis)

Odd:  $f(x) = -f(-x)$  (symmetry with respect to the origin)

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### Interval Notation

(1)	$(a, b)$	$\rightarrow$	$a < x < b$	(2)	$(a, b]$	$\rightarrow$	$a < x \leq b$
(3)	$[a, b)$	$\rightarrow$	$a \leq x < b$	(4)	$[a, b]$	$\rightarrow$	$a \leq x \leq b$
(5)	$(a, \infty)$	$\rightarrow$	$a < x$	(6)	$[a, \infty)$	$\rightarrow$	$a \leq x$
(7)	$(-\infty, a]$	$\rightarrow$	$x \leq a$	(8)	$(-\infty, a)$	$\rightarrow$	$x < a$

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For problems 1 – 4, find (a) the domain, (b) the range, and (c) any symmetry

1.  $y = x^3 - 1$

2.  $y = \sqrt{x + 3}$

3.  $y = x^{\frac{4}{3}}$

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

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For problems 5 – 7, determine whether the function is even, odd, or neither.

5.  $y = \sqrt{x^4 + 1}$

6.  $y = \frac{x}{x^2 + 2}$

7.  $y = x + x^3 + 1$