

Chapter P

Preparation for Calculus

Definition of the Slope of a Line

The **slope** m of the nonvertical line passing through (x_1, y_1) and (x_2, y_2) is

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}, \quad x_1 \neq x_2.$$

Slope is not defined for vertical lines.

Point-Slope Equation of a Line

An equation of the line with slope m passing through the point (x_1, y_1) is given by

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

The Slope-Intercept Equation of a Line

The graph of the linear equation

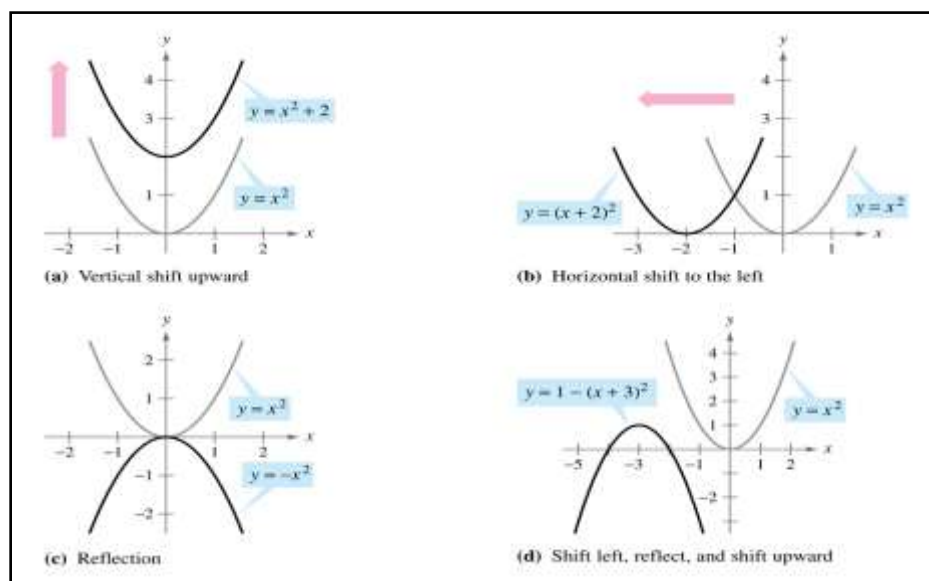
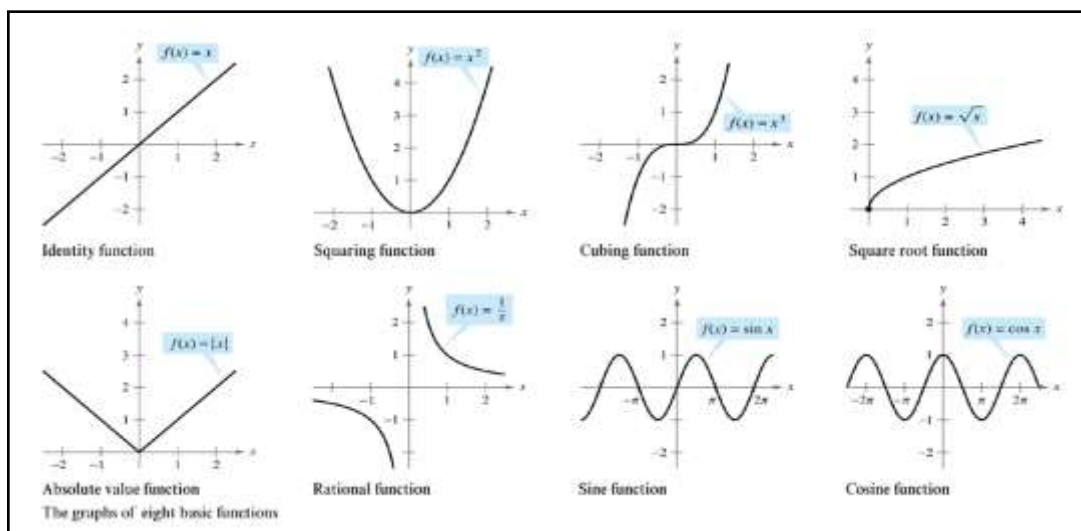
$$y = mx + b$$

is a line having a *slope* of m and a *y-intercept* at $(0, b)$.

Parallel and Perpendicular Lines

1. Two distinct nonvertical lines are **parallel** if and only if their slopes are equal—that is, if and only if $m_1 = m_2$.
2. Two nonvertical lines are **perpendicular** if and only if their slopes are negative reciprocals of each other—that is, if and only if

$$m_1 = -\frac{1}{m_2}.$$



Basic Types of Transformations ($c > 0$)

Original graph:	$y = f(x)$
Horizontal shift c units to the right :	$y = f(x - c)$
Horizontal shift c units to the left :	$y = f(x + c)$
Vertical shift c units downward :	$y = f(x) - c$
Vertical shift c units upward :	$y = f(x) + c$
Reflection (about the x -axis):	$y = -f(x)$
Reflection (about the y -axis):	$y = f(-x)$
Reflection (about the origin):	$y = -f(-x)$

Test for Even and Odd Functions

The function $y = f(x)$ is **even** if $f(-x) = f(x)$.

The function $y = f(x)$ is **odd** if $f(-x) = -f(x)$.

Even function:

Like $y = x^2$

Symmetric on the y-axis

Looks the same when flipped horizontally

Odd function:

Like $y = x^3$

Symmetric on the origin

Looks the same when rotated 180°