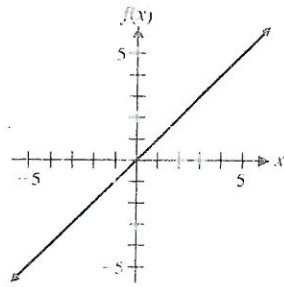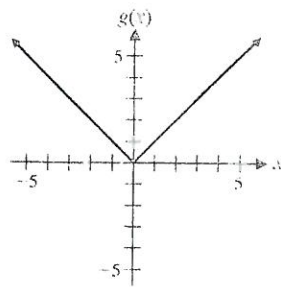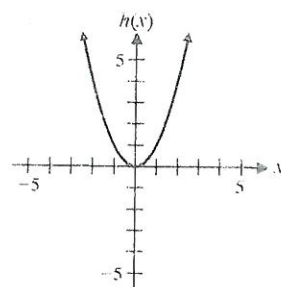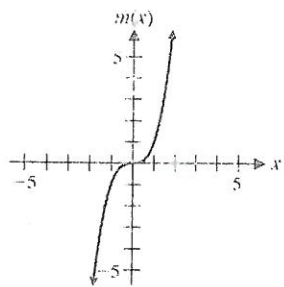# A LIBRARY OF ELEMENTARY FUNCTIONS
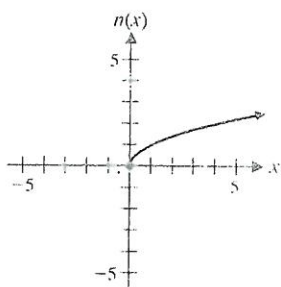
BASIC FUNCTIONS

Identity function
$f(x) = x$

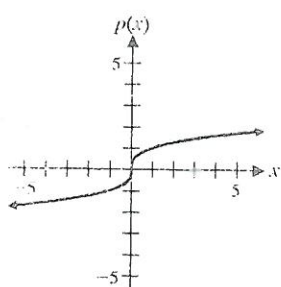Absolute value function
$g(x) = |x|$

Square function
$h(x) = x^2$

Cube function
$m(x) = x^3$

Square root function
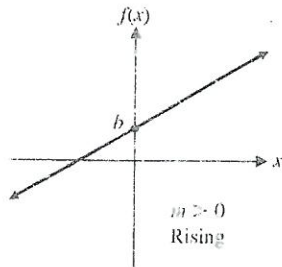$n(x) = \sqrt{x}$

Cube root function
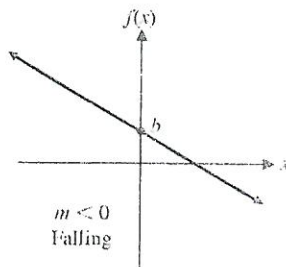$p(x) = \sqrt[3]{x}$

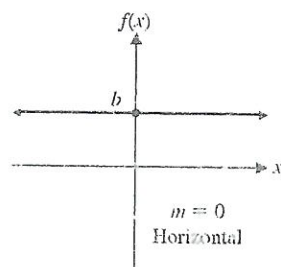## LINEAR AND CONSTANT FUNCTIONS

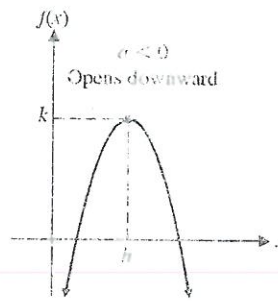$m > 0$
Rising

Linear function
$f(x) = mx + b$

$m < 0$
Falling

Linear function
$f(x) = mx + b$

$m = 0$
Horizontal

Constant function
$f(x) = b$

QUADRATIC FUNCTIONS

$a > 0$
Opens upward

$a < 0$
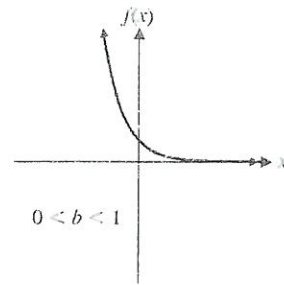Opens downward
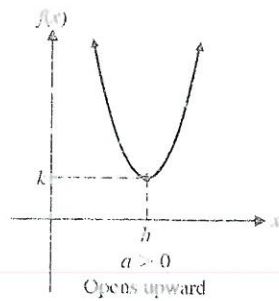
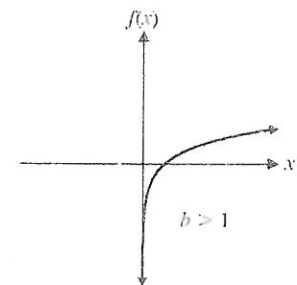$$f(x) = ax^2 + bx + c = a(x - h)^2 + k$$

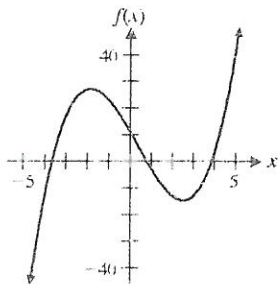## EXPONENTIAL AND LOGARITHMIC FUNCTIONS
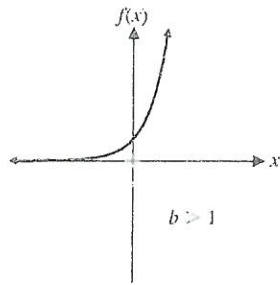
Exponential function
$f(x) = b^x$
$b > 1$

Exponential function
$f(x) = b^x$
$0 < b < 1$

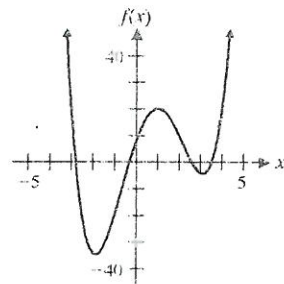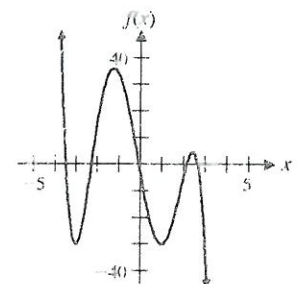Logarithmic function
$f(x) = \log_b x$
$b > 1$

REPRESENTATIVE POLYNOMIAL FUNCTIONS (DEGREE > 2)
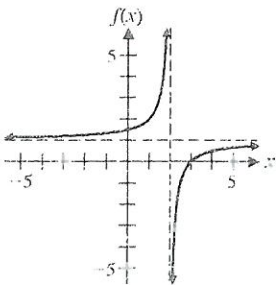
Third-degree polynomial
$f(x) = x^3 - x^2 - 14x + 11$

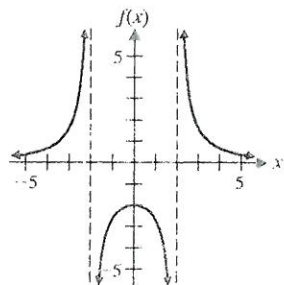Fourth-degree polynomial
$f(x) = x^4 - 3x^3 - 9x^2 + 23x + 8$

Fifth-degree polynomial
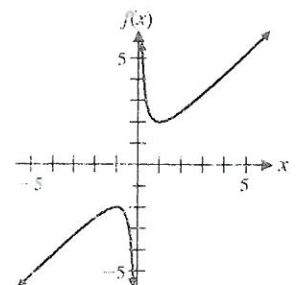$f(x) = -x^5 - x^4 + 14x^3 + 6x^2 - 45x - 3$

REPRESENTATIVE RATIONAL FUNCTIONS
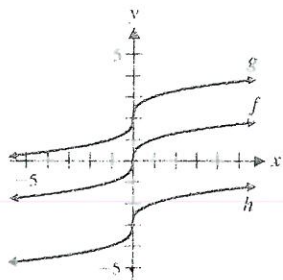
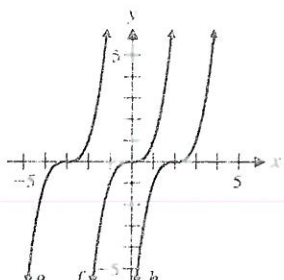$f(x) = \dfrac{x - 3}{x - 2}$

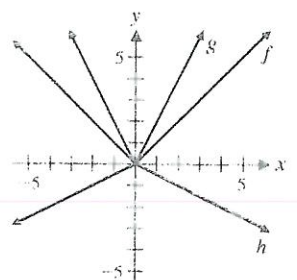$f(x) = \dfrac{8}{x^2 - 4}$

$f(x) = x + \dfrac{1}{x}$

GRAPH TRANSFORMATIONS

Vertical shift
$g(x) = f(x) + 2$
$h(x) = f(x) - 3$

Horizontal shift
$g(x) = f(x + 3)$
$h(x) = f(x - 2)$

Stretch, shrink and reflection
$g(x) = 2f(x)$
$h(x) = -0.5f(x)$