Unit 1 Review – Basic Functions

1. Find the domain of the following functions.

a) $f(x) = \frac{2}{(x-2)}$

$X - 2 \neq 0$
$X \neq 2$

$(-\infty, 2) \cup$
$(2, \infty)$

b) $f(x) = \frac{2x+3}{x^2-7x+10}$

$(x-5)(x-2) \neq 0$
$X \neq 2 \; X \neq 5$
$(-\infty, 2) \cup (2, 5) \cup (5, \infty)$

c) $f(x) = \sqrt{2x-8}$

$2x - 8 \geq 0$
$X \geq 4$
$[4, \infty)$

d) $f(x) = \frac{\sqrt{x-3}}{2x-12}$

$X - 3 \geq 0$
$X \geq 3$
$2x - 12 \neq 0$
$X \neq 6$

$[3, 6) \cup (6, \infty)$

2. Find the inverse of the function:

a. $f(t) = \sqrt{4-3t}$

$X = \sqrt{4-3y}$
$x^2 = 4 - 3y$
$x^2 - 4 = -3y$
$\dfrac{}{-3}$

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

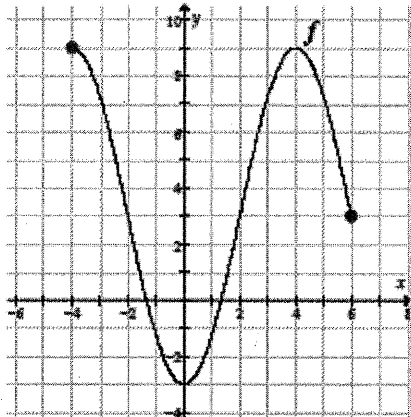b. $g(x) = \frac{2x+5}{x+4}$

$X = \dfrac{2y+5}{y+4}$
$Xy + 4x = 2y + 5$
$Xy - 2y = -4x + 5$
$y(x-2) = -4x + 5$

$y = \dfrac{-4x+5}{x-2}$

3. The graph of $y = f(x)$ is shown below.

(a) Find the domain of the function. Write your answer in interval notation. $[-4, 6]$

(b) Find the range of the function. Write your answer in interval notation. $[-3, 9]$

(c) Find the y-intercept(s) of the function. $(0, -3)$

(d) Find the following function values:
$f(-2); \; f(0); \; f(4); \; f(6)$ $3, -3, 9, 3$

(e) For what value(s) of x is $f(x) = 9$? $X = -4 \text{ and } X = 4$

(f) On what interval(s) is f increasing? $(0, 4)$

(g) On what interval(s) is f decreasing? $(-4, 0) \cup (4, 6)$

$X \text{ values!} <$

(h) What is the maximum value of the function? $y = 9$

(i) What is the minimum value of the function? $y = -3$

Unit 2 Review – Polynomial Functions

$\max(34, 1156)$

1. The sum of two numbers is 68. Find the maximum value of their product.

$\boxed{1156}$

2 #'s x $68-x$ $\text{Product} = x(68-x) = 68x - x^2$

2. Find the zeroes of $2x^2 - 12x - 14 = 0$ using each of the following methods:

Factoring

$2(x^2 - 6x - 7) = 0$

$2(x-7)(x+1) = 0$

$\boxed{X = 7 \quad X = -1}$

Quadratic Formula

$x = \dfrac{12 \pm \sqrt{144 - 4(2)(-14)}}{2(2)}$

$x = \dfrac{12 \pm \sqrt{256}}{4} = \dfrac{12 \pm 16}{4}$

$\boxed{X = 7 \quad X = -1}$

Complete the Square $\div$ by 2 first!

$x^2 - 6x - 7 = 0$

$x^2 - 6x + \underline{9} = 7 + \underline{9}$

$(x-3)^2 = 16$

$x - 3 = \pm 4$

$x = 3 \pm 4$

$\boxed{X = 7 \\ X = -1}$

3. Find all 3 roots (You may use your calculator for the first root only, then synthetic division!):

$x^3 - 7x + 6 = 0$

$X = 2$ is a root

$$\begin{array}{c|cccc} 2 & 1 & 0 & -7 & 6 \\ & \downarrow & 2 & 4 & -6 \\ \hline & 1 & 2 & -3 & 0 \end{array}$$

$x^2 + 2x - 3 = 0$

$(x+3)(x-1) = 0$

$\boxed{X = -3 \quad X = 1 \quad X = 2}$

4. $f(x) = x^2 + 11x + 24$

   $g(x) = x + 2$

Evaluate $f(g(x))$

$(x+2)^2 + 11(x+2) + 24$

$x^2 + 4x + 4 + 11x + 22 + 24$

$\boxed{x^2 + 15x + 40}$

Evaluate $f(g(6))$

$f(6+2)$

$f(8) = 64 + 88 + 24$

$= \boxed{176}$

Evaluate $g(f(-3))$

$g((-3)^2 + 11(-3) + 24)$

$g(9 - 33 + 24) = g(30)$

$30 + 2 = \boxed{32}$

Unit 3 Review – Rational Functions

1. Simplify the rational function:

$y = \dfrac{4x+12}{x-1} \div \dfrac{x^2+5x+6}{x^2-8x+7}$

$\dfrac{4(x+3)}{(x-1)} \cdot \dfrac{(x-7)(x-1)}{(x+2)(x+3)} = \boxed{\dfrac{4(x-7)}{x+2}}$

2. Identify any holes and asymptotes

$y = \dfrac{x^2 - 5x + 6}{x^2 - 9} = \dfrac{(x-2)(x-3)}{(x+3)(x-3)} = \boxed{\dfrac{x-2}{x+3}}$

Hole $(3, \frac{1}{6})$

VA $x = -3$

HA $y = 1$

3. Solve the equation for x:

Subtract 2

$\dfrac{3}{x+2} + 4 = \dfrac{-5}{x+2}$

$\dfrac{4}{1} = \dfrac{-8}{x+2}$

$4x + 8 = -8$

$4x = -16$

$\boxed{X = -4}$

4. Find the slant asymptote. (Long or Synthetic Division!)

$y = \dfrac{x^2 + 3x + 9}{x-2}$

$$\begin{array}{r} x+1 \\ x-2 \overline{)\, x^2 + 3x + 9} \\ \underline{x^2 - 2x} \\ x + 9 \\ \underline{x - 2} \\ 7 \end{array}$$
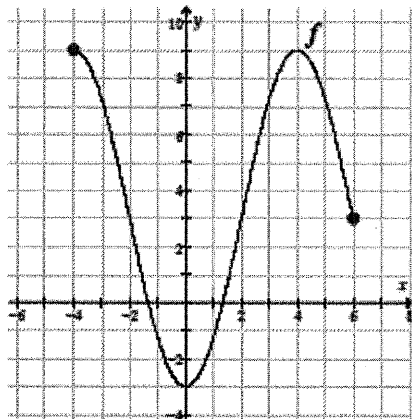
$\boxed{y = x+1}$

Unit 1 Review – Basic Functions

1. **Find the domain of the following functions.**

a) $f(x) = \frac{2}{(x-2)}$
   b) $f(x) = \frac{2x+3}{x^2-7x+10}$
   c) $f(x) = \sqrt{2x-8}$
   d) $f(x) = \frac{\sqrt{x-3}}{2x-12}$

2. **Find the inverse of the function:**
   a. $f(t) = \sqrt{4-3t}$
   b. $g(x) = \frac{2x+5}{x+4}$

3. The graph of $y = f(x)$ is shown below.

(a) Find the domain of the function. Write your answer in interval notation.

(b) Find the range of the function. Write your answer in interval notation.

(c) Find the y-intercept(s) of the function.

(d) Find the following function values:
   $f(-2)$; $f(0)$; $f(4)$; $f(6)$

(e) For what value(s) of x is $f(x) = 9$?

(f) On what interval(s) is f increasing?

(g) On what interval(s) is f decreasing?

(h) What is the maximum value of the function?

(i) What is the minimum value of the function?

Unit 2 Review – Polynomial Functions

1. The sum of two numbers is 68. Find the maximum value of their product.

2. Find the zeroes of $2x^2 - 12x - 14 = 0$ using each of the following methods:

Factoring   **Quadratic Formula**   **Complete the Square**

3. Find all 3 roots (You may use your calculator for the first root only, then synthetic division!):
$x^3 - 7x + 6 = 0$

4. $f(x) = x^2 + 11x + 24$
   $g(x) = x + 2$

Evaluate $f(g(x))$ **Evaluate $f(g(6))$**   **Evaluate $g(f(-3))$**

Unit 3 Review – Rational Functions

1. Simplify the rational function:

$$y = \frac{4x+12}{x-1} \div \frac{x^2+5x+6}{x^2-8x+7}$$

2. Identify any holes and asymptotes

$$y = \frac{x^2-5x+6}{x^2-9}$$

3. Solve the equation for x:

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

4. Find the slant asymptote.

$$y = \frac{x^2+3x+9}{x-2}$$