LESSON PLAN

Course: Grade 12 U Advanced Functions   **Lesson: 2 - 3**

**Unit/Chapter: Functions**   **Topic: Piecewise Functions**

❑ *homework check:* **FM12** p. 193 exercise 6.5 #4, 5(odds),6 – 8

❑ *notes:* **Piecewise Functions**

Piecewise functions involve the use of different types of graphs for different domains. When these different types of graphs are pieced together so that the domain does not intersect or overlap, they form a piecewise function. For example,
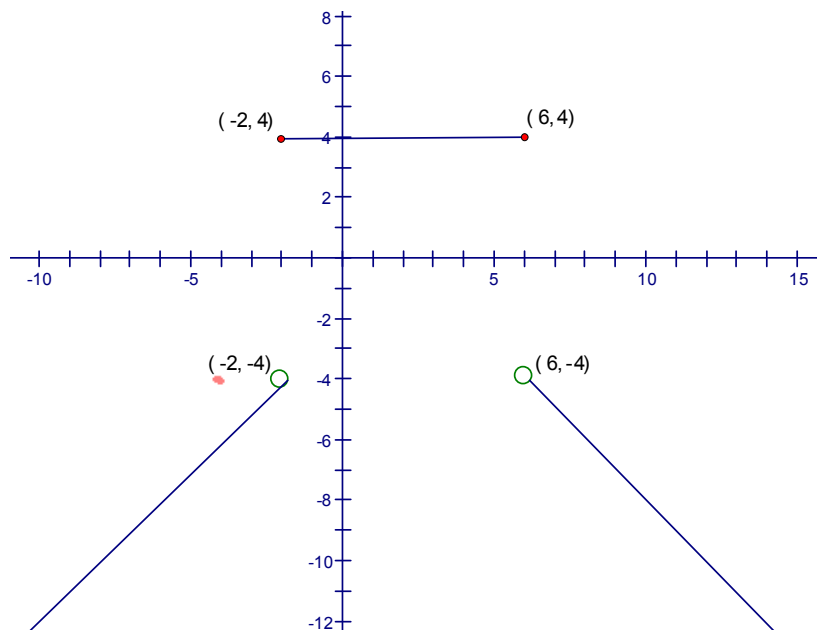
a) $f(x) = \begin{cases} x & \text{if } x \le 0 \\ x^2 & \text{if } x > 0 \end{cases}$
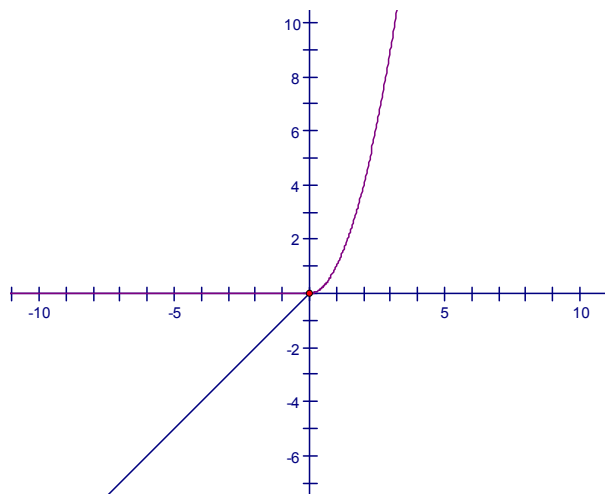
$f(-3) =$ because the -3 falls into the domain of the first piece of the function
$f(-3) = x$
$\quad = -3$

$f(2) =$ positive 2 falls into the domain of the second piece of the function
$f(2) = x^2$
$\quad = 4$

b) $f(x) = \begin{cases} x-2 & \text{if } x < -2 \\ 4 & \text{if } -2 \le x \le 6 \\ -x+2 & \text{if } x > 6 \end{cases}$

$f(-3) = -5$
$f(0) = 4$
$f(7) = -5$

⊞ *homework assignments:* **FM12** p. 181 exercise 6.2 # 1, 2, & 8

EXERCISE 6.2

1. State whether the given function is linear, quadratic, cubic, a higher-degree polynomial (state the degree), rational, or a root function.

(a) $f(x) = x^2 + 2x + 6$ (b) $g(x) = \sqrt{x}$

(c) $h(x) = 2x - 1$ (d) $y = x^3 + x$

(e) $y = \dfrac{x^3 + x}{x^2 + 1}$ (f) $F(x) = 1 - x$

(g) $G(x) = x^6 - 2x^4 + x^2 - 1$

(h) $H(x) = \dfrac{x + 1}{x - 1}$

(i) $f(t) = t^4 - 2t + 1$

(j) $g(t) = 1 + t^2$

(k) $h(t) = 2 - 6t + t^2 - 6t^3$

(l) $R(t) = \dfrac{1}{t^2 - 2}$

2. The following functions are defined by different formulas in different parts of their domains. In each case find

(a) $f(-1)$

(b) $f(0)$

(c) $f(1)$

and graph the function.

(i) $f(x) = \begin{cases} 0 \text{ if } x < 0 \\ 1 \text{ if } x \geqslant 0 \end{cases}$

(ii) $f(x) = \begin{cases} -x \text{ if } x < 0 \\ x^2 \text{ if } x \geqslant 0 \end{cases}$

(iii) $f(x) = \begin{cases} -1 \text{ if } -3 \leqslant x \leqslant 1 \\ 1 \text{ if } 1 < x < 2 \\ 4 \text{ if } 2 \leqslant x \leqslant 4 \end{cases}$

(iv) $f(x) = \begin{cases} -1 \text{ if } x \leqslant -1 \\ x \text{ if } -1 < x < 1 \\ 1 \text{ if } x \geqslant 1 \end{cases}$

(v) $f(x) = \begin{cases} -3 - x \text{ if } -3 \leqslant x < -2 \\ 1 + x \text{ if } -2 \leqslant x < 0 \\ 1 - x \text{ if } 0 \leqslant x < 2 \\ -3 + x \text{ if } 2 \leqslant x \leqslant 3 \end{cases}$

(vi) $f(x) = \begin{cases} (x + 1)^2 \text{ if } x < 0 \\ 0 \text{ if } x = 0 \\ (x - 1)^2 \text{ if } x > 0 \end{cases}$

8. Graph each of the following functions.

(a) $f(x) = \begin{cases} 1 \text{ if } x \leqslant -1 \\ -x \text{ if } -1 < x \leqslant 0 \\ x \text{ if } 0 < x \leqslant 1 \\ 1 \text{ if } x > 1 \end{cases}$

(b) $g(x) = \begin{cases} -x - 2 \text{ if } x < -1 \\ x \text{ if } -1 \leqslant x < 0 \\ -x \text{ if } 0 \leqslant x < 1 \\ x - 2 \text{ if } x \geqslant 1 \end{cases}$

(c) $h(x) = \begin{cases} -8 \text{ if } x \leqslant -2 \\ x^3 \text{ if } -2 < x < 2 \\ 8 \text{ if } x \geqslant 2 \end{cases}$

(d) $F(x) = \begin{cases} x + 6 \text{ if } x \leqslant -2 \\ x^2 \text{ if } -2 < x < 2 \\ x + 2 \text{ if } x \geqslant 2 \end{cases}$

EXERCISE 6.2

1. (a) quadratic
   (c) linear
   (e) rational
   (g) 6th degree polynomial
   (i) 4th degree polynomial (quartic)
   (k) cubic

   (b) a root function (square root)
   (d) cubic
   (f) linear
   (h) rational
   (j) quadratic
   (l) rational

2. (i) (a) 0   (b) 1   (c) 1
   (ii) (a) 1   (b) 0   (c) 1

A

   (iii) (a) −1   (b) −1   (c) −1
   (iv) (a) −1   (b) 0   (c) 1
   (v) (a) 0   (b) 1   (c) 0
   (vi) (a) 0   (b) 0   (c) 0