Unit #2 Functions

2.1 Function Notation

Definitions:

A relation is a set of ordered pairs which connects elements in the domain (x-values or inputs) with elements in the range (y-values or outputs).

A function is a rule or correspondence that connects an input number (domain element) with a single output number (range element).

For every x value there is one and only one y value!

Every function is a relation, but every relation is not a function!

You will recognize the following as an equation (a relationship between two variables)

$$y = 2x^2 - 3x + 1$$

$f(3) = 7$

This equation describes y as a function of x.

$(3, 7)$

If we give this function the name *f*, we can use Function Notation.

$$f(x) = 2x^2 - 3x + 1$$

This notation is read as the *"value of f at x "* or *"f of x"*.

Function Notation allows us an easy way of asking the question.

Find the value of y when x is 2. So, if

$$f(x) = 2x^2 - 3x + 1$$

Find $f(2)$ Replace the x with a 2

$$f(2) = 2(2)^2 - 3(2) + 1$$

$$f(2) = 8 - 6 + 1$$

$$f(2) = 3$$

Ex. 1 If $f(x) = 2x^2 - 3x$ find the following:

$f(4)$

-5^2

$(-5)^2$

$f(-5)$

$= 2(-5)^2 - 3(-5)$

$= 50 + 15 = 65$

$f(a)$

$= 2a^2 - 3a$

$f(b-7)$

$= 2(b-7)^2 - 3(b-7)$

$= 2(b^2 - 14b + 49) - 3b + 21$

$= 2b^2 - 28b + 98 - 3b + 21$

$= 2b^2 - 31b + 119$

Ex. 2 If $f(x)=\dfrac{x+2}{x}$ find the following:

$f(-2)$

$f(0) = \dfrac{0+2}{0}$

UND

$f\left(\dfrac{2}{3}\right)$

$= \dfrac{\frac{2}{3}+\frac{6}{3}}{\frac{2}{3}} = \dfrac{\left(\frac{8}{3}\right)}{\left(\frac{2}{3}\right)} = \left(\dfrac{8}{\cancel{3}}\right)\left(\dfrac{\cancel{3}}{2}\right) = 4$

f()

Ex.3 If $f(x)=1-4x$, find:

$a)\ \ f(3k)$

b) $f\left(\dfrac{3}{x}\right)$

$f(x) = 2x - 4$

a) $\dfrac{\boxed{f(x+h)} - \boxed{f(x)}}{h}$

$= \dfrac{2(x+h) - 4 - (2x - 4)}{h}$

$= \dfrac{\cancel{2x} + 2h \cancel{- 4} \cancel{- 2x} \cancel{+ 4}}{h}$

$= \dfrac{2\cancel{h}}{\cancel{h}} = 2$

$f(x) = 7x + x^2$

$f(2) =$

$$f(x) = 3x - x^2$$

$$\frac{f(x+h) - f(x)}{h}$$

$$= \frac{3(x+h) - (x+h)^2 - (3x - x^2)}{h}$$

$$= \frac{3x + 3h - (x^2 + 2xh + h^2) - 3x + x^2}{h}$$

$$= \frac{\cancel{3x} + 3h \cancel{- x^2} - 2xh - h^2 \cancel{- 3x} + \cancel{x^2}}{h}$$

$$= \frac{3h - 2xh - h^2}{h}$$

$$= \frac{\cancel{h}\boxed{(3-2x-h)}}{\cancel{h}}$$

$f(x) = 1 - 4x$

$d)\ \ x, \text{if } f(x) = -31$

$-31 = 1 - 4x$

$-32 = -4x$

$8 = x$

Your Turn #4

Examine the graph of the function below to answer each of the following questions.

Find:

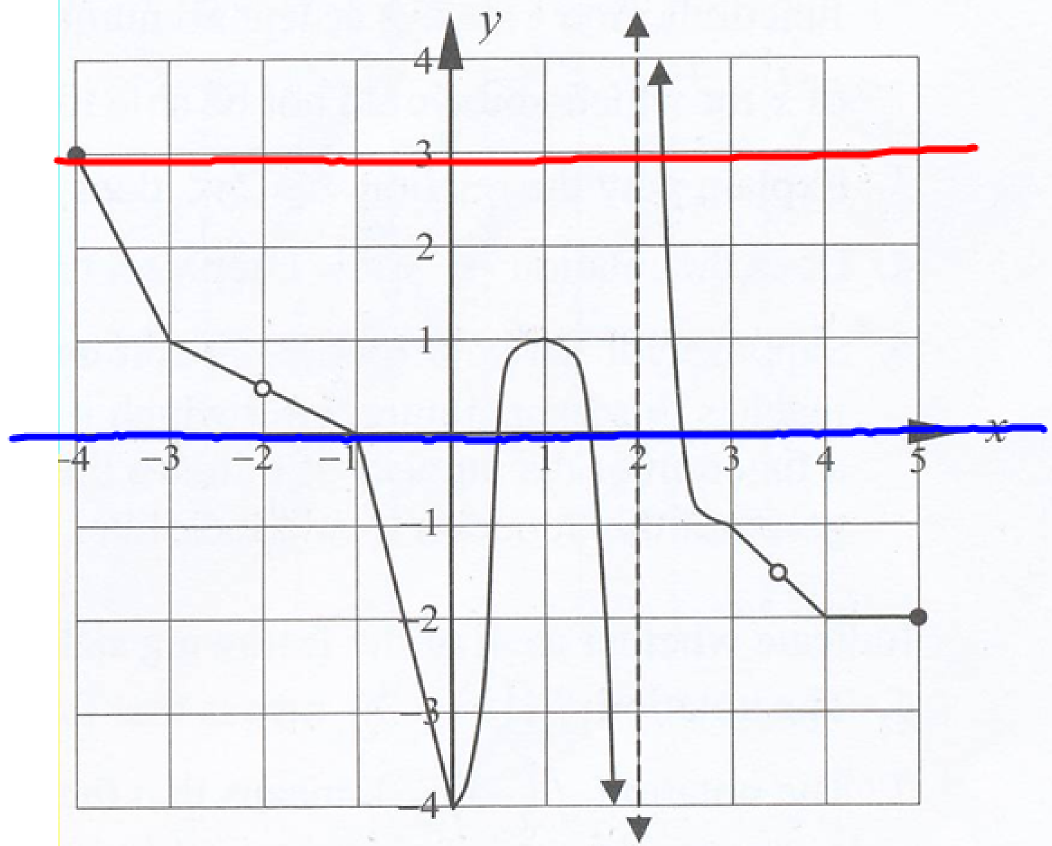
(a) $g(1)$ = 1

(b) $g(-4)$ = 3

(c) $g(3.5)$ = DNE

(d) four values of x for which $g(x) = 0$

(e) r, if $g(r) = 3$ and $r < 0$.



$y = g(x)$

d) $x = -1, \frac{1}{2}, \frac{3}{2}, \frac{5}{2}$

e) $r = -4$

Assignment:
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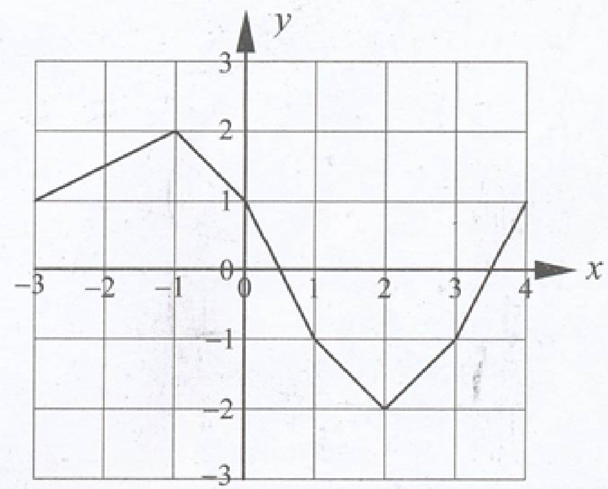
#'s 1, 2 a-d, 3-12,14

Answer questions 6 to 10 by referring to the graph of the function $y = f(x)$ over the domain $[-3, 4]$ shown at right.



6. Find: (a) $f(-1)$ (b) $f(3)$ (c) $f(2.5)$ (d) $f(0)$

7. Find all values of c for which $f(c) = 1$.

8. Find all values of r for which $f(r) = -2$.

9. Find all values of t for which $f(t) = 0$.

10. Find all values of s in the interval $[0, 4]$ for which $f(s) = -1$.