Math 71 – Spring 2009 Name:

# QUIZ #1 @ 55 points

Write in a neat and organized fashion. Write your complete solutions on SEPARATE PAPER. You should use a pencil. For an exercise to be complete there needs to be a detailed solution to the problem. Do not just write down an answer. No proof, no credit given! Clearly label each exercise.

1. Find the indicated function value.

a) $f(5)$ for $f(x)=2x+1$

b) $h(-2)$ for $h(r)=r^3-2r^2+4$

c) $g(-x)$ for $g(x)=2x^2-2x+1$

d) $F(a+h)$ for $f(x)=6x-2$.

2. Find the indicated function values for $f(x)=\begin{cases}6x-1, & \text{if } x<0\\ 7x+3, & \text{if } x\geq 0\end{cases}$.

a) $f(4)$ b) $f(0)$ c) $f(-3)$

3. The graph shown represents $y=f(x)$.

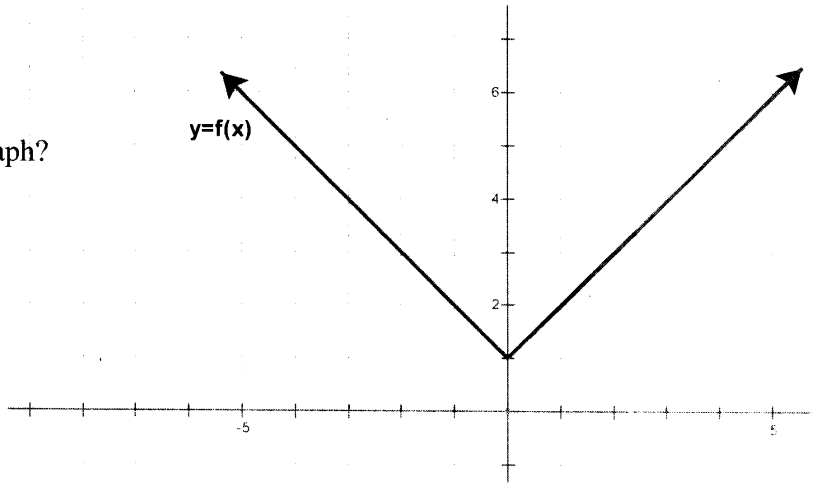
a) Is $y$ a function of $x$? Why?

b) Find the domain and range.

c) What are the intercepts of the graph?

d) Find $f(2)$.

e) Solve $f(x)=4$




4. Let $f(x)=3x+2$, $g(x)=x^2-x-1$, and $h(x)=\dfrac{3x+2}{x-1}$. Answer the following:

a) Find the domain of each function.

b) Find $(f+g)(x)$.

c) Find $(f+g)(1)$.

d) Find $(fg)(x)$.

5. Let $B(x)=7.4x^2-15x+4046$ represent the number of births, in thousands, $x$ years after 2000.

Let $D(x)=-3.5x^2+20x+2405$ represent the number of deaths, in thousands, $x$ years after 2000.

Answer the following:

a) What was the number of births in 2000?

b) What was the number of deaths in 2001?

c) Write a function that models the change in U.S. population for each year from 2000.

M71 Quiz #1 - solutions

(1) (a) $f(x) = 2x+1$

$f(5) = 2(5)+1$

$\boxed{f(5) = 11}$

(b) $h(r) = r^3 - 2r^2 + 4$

$h(-2) = (-2)^3 - 2(-2)^2 + 4$

$h(-2) = -8 - 2(4) + 4$

$\boxed{h(-2) = -12}$

(c) $g(x) = 2x^2 - 2x + 1$

$g(-x) = 2(-x)^2 - 2(-x) + 1$

$\boxed{g(-x) = 2x^2 + 2x + 1}$

(d) $f(x) = 6x - 2$

$f(a+h) = 6(a+h) - 2$

$\boxed{f(a+h) = 6a + 6h - 2}$

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(2) $f(x) = \begin{cases} 6x-1, & x < 0 \\ 7x+3, & x \geq 0 \end{cases}$

(a) $f(4) = 7(4) + 3$ (because $4 \geq 0$)

$\boxed{f(4) = 31}$

(b) $f(0) = 7(0) + 3$ (because $0 \geq 0$)

$\boxed{f(0) = 3}$

(c) $f(-3) = 6(-3) - 1$ (because $-3 < 0$)

$\boxed{f(-3) = -19}$

(3) (a) yes, the graph passes the Vertical Line Test

(b) Domain: $x \in \mathbb{R}$

Range: $y \in [1, \infty)$

(c) $x$-int: none

$y$-int: $(0,1)$

(d) $f(2) = 3$ because when $x = 2$, $y = 3$

(e) $f(x) = 4$ when $x = -3$ and $x = 3$

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(4) (a) $f(x) = 3x + 2$

Domain: $\boxed{x \in \mathbb{R}}$

$g(x) = x^2 - x - 1$

Domain: $\boxed{x \in \mathbb{R}}$

$h(x) = \dfrac{3x+2}{x-1}$

Domain: condition $x - 1 \neq 0$

$x \neq 1$

so, $\boxed{x \in \mathbb{R} \setminus \{1\}}$

(b) $(f+g)(x) = f(x) + g(x)$

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

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

$\boxed{(f+g)(x) = x^2 + 2x + 1}$

(c) $(f+g)(1) = 1^2 + 2(1) + 1$

$\boxed{(f+g)(1) = 4}$

(d) $(fg)(x) = f(x) \cdot g(x)$

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

$= 3x^3 - 3x^2 - 3x$

$+ 2x^2 - 2x - 2$

$\boxed{(fg)(x) = 3x^3 - x^2 - 5x - 2}$

(5) $B(x) = 7.4x^2 - 15x + 4046$

$D(x) = -3.5x^2 + 20x + 2405$

(a) For year 2000, $x = 0$

$B(0) = 4046$ thousand births in 2000

(b) For year 2001, $x = 1$

$D(1) = -3.5(1)^2 + 20(1) + 2405$

$D(1) = 2421.5$ thousand deaths in 2001

(c) let $f(x)$ = change in U.S. population (in thousands), $x$ years after 2000

$f(x) = B(x) - D(x)$

$f(x) = (7.4x^2 - 15x + 4046) -$

$-(-3.5x^2 + 20x + 2405)$

$f(x) = 7.4x^2 - 15x + 4046 + 3.5x^2$

$- 20x - 2405$ )

so $\boxed{f(x) = 10.9x^2 - 35x + 1641}$