# MTH 111

## Answer Key to the Practice Problems for Exam 1

## I

**1**.

(a) $f(0)=3$; (b) $f(2)=4(2)^2-2+3=16-2+3=17$.

(c) $f(-2)=4(-2)^2-(-2)+3=4\cdot 4+2+3=16+2+3=21$.

(d) $f(-x)=4(-x)^2-(-x)+3=4x^2+x+3$; (e) $f(t)=4t^2-t+3$

(f) $f(2-t)=4(2-t)^2-(2-t)+3=4(4-4t+t^2)-2+t+3=4t^2-15t+17$

**2**.

(a) $g(-5)=0$; (b) $g(2)$ undefined, since we cannot divide by 0.

(c) $g(x+h)=\dfrac{x+h+5}{x+h-2}$; (d) $g(1-a)=\dfrac{(1-a)+5}{(1-a)-2}=\dfrac{6-a}{-1-a}=\dfrac{a-6}{a+1}$

**3**.

(a) All real numbers; (b) All real numbers except 0;

(c) All real numbers except –1 and 1.

## II

**1**

(a) Equation: $y=-3x+5$

(b) Slope: $m=\dfrac{2-0}{-2-2}=\dfrac{2}{-4}=-\dfrac{1}{2}$. This gives $y-0=-\dfrac{1}{2}(x-2)$ or

$y=-\dfrac{1}{2}x+1$

(c) The slope of the line is 3, so using the point-slope equation, we get
$y-1=3(x+1)$ i.e. $y=3x+4$

(d) Let $m$ be the slope. Then $3m=-1$, so $m=-\dfrac{1}{3}$

The point-slope equations gives $y-1=-\dfrac{1}{3}(x+1)$. That is $y=-\dfrac{1}{3}x+\dfrac{2}{3}$

**2.**

(a) Solving for $y$ we get $y=2x+2$. So the slope is 2 and the $y$-intercept is 2 or (0, 2)..

(b) Solving for $y$, we get $y=-\dfrac{3}{4}x+2$. The slope is $-\dfrac{3}{4}$ and the $y$-intercept is 2 or (0, 2)

## III

**1**. #24, page 117

Let $h$ be the height of the triangle. Then its base is $2h-7$. Let $A$ be its area, then

$$A=\frac{h(2h-7)}{2}.$$

**2**. (a) $(f+g)(4)=f(4)+g(4)=(2(4)^2+1)+(4-2)=32+1+4-2=35$

(b) $(f-g)(0)=1-(-2)=3$

(c) $(fg)(-1)=f(-1)g(-1)=(2(-1)^2+1)(-1-2)=3(-3)=-9.$

(d) $\left(\frac{f}{q}\right)(4)=\frac{f(4)}{g(4)}=\frac{2(4)^2+1}{4-1}=\frac{33}{2}$

(e) $\left(\frac{f}{g}\right)(2)=\frac{f(2)}{g(2)}$ not defined since we can divide by 0.

**3**. (a)

Domain of $f$: all real numbers.

Domain of $g$: All nonnegative real numbers (positive and 0).

Domain of $f+g$: All nonnegative real numbers.

Domain of $f-g$: All nonnegative real numbers.

Domain of $fg$: All nonnegative real numbers.

Domain of $ff$: All real numbers.

Domain of $f/g$: All positive real numbers.

(b)

$(f+g)(x)=f(x)+g(x)=x^2+\sqrt{x}$; $(f-g)(x)=f(x)-g(x)=x^2-\sqrt{x}$

$(fg)(x)=f(x)g(x)=x^2\sqrt{x}$; $(ff)(x)=f(x)f(x)=(x^2)(x^2)=x^4.$

$$\left(\frac{f}{g}\right)(x)=\frac{f(x)}{g(x)}=\frac{x^2}{\sqrt{x}}.$$

**4**.

$$\frac{f(x+h)-f(x)}{h}=\frac{\left[3(x+h)^2-2(x+h)\right]-\left[3x^2-2x\right]}{h}=\frac{3(x^2+2xh+h^2)-2x-2h-3x^2+2x}{h}$$

This yields

$$\frac{f(x+h)-f(x)}{h}=\frac{6xh-2h+h^2}{h}=\frac{h(6x-2+h)}{h}=6x-2+h$$

## IV

**1**.

# 33, page 135

We get

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

So this is and odd function.

#34, page135

$f(-x) = 7(-x)^3 - 4x - 2 = -7x^3 - 4x - 2$
This neither an even function nor an odd function.
#35, page 135
$f(-x) = 5(-x)^2 + 2(-x)^4 - 1 = 5x^2 + 2x^4 - 1 = f(x).$
So this is an even function..
#40, page135: Neither
# 42, page135: Even function
#45, page135 : Horizontal shift of the graph of the function $y = x^3$ by 5 units to the left.
#54, page136, Reflection of the graph of the function $y = x^3$ across the x-axis, then shifted up by 5 units.

**2.**
# 2, page 144:
$y = kx$ and $0.1 = 0.2k$. Thus $\frac{0.1}{0.2} = \frac{1}{2}$, i.e. $y = \frac{1}{2}x.$
# 6, page 144:
$y = \frac{k}{x}$ and $0.1 = \frac{k}{0.5}$. This yields $k = 0.1(0.5) = 0.05.$
Thus $y = \frac{0.05}{x}$
# 16, page 136
We have $t = \frac{k}{r}$. When $r = 80$, $t = 5$. Thus $5 = \frac{k}{80}$, that is $k = 400.$
We get $t = \frac{400}{r}.$
If $r = 70$, we get $t = \frac{400}{70} \approx 5.71$ hrs, about 4 hours and 43 minutes