Name: Key

Unit 5 Review – Functions

Helpful Information:

Function – x-values can NOT repeat (vertical line test)

Domain – x-values

Range- y-values

One-To-One – function in which y-values can NOT repeat (horizontal line test)

Inverse – $f^{-1}(x)$ – switch x and y, then solve for y

Composition – $\boldsymbol{f(g(x)) = (f \circ g)(x)}$ $\quad$ ($f(f^{-1}(x))$ used to prove inverses)

Transformations – (remember x changes opposite)

	Reflection	Dilations	Translations
Changes on x	$f(-x)$	$f(a \cdot x)$	$f(x+a)$
Changes on y	$-f(x)$	$a \cdot f(x)$	$f(x)+a$

Even Functions – symmetric about the ~~x~~ y-axis ($f(x) = f(-x)$) **Example: $y = \cos x$

Odd Functions – symmetric about the origin (180º rotation) ($-f(x) = f(-x)$) **Example: $y = \sin x$

Level I Practice:

1. If $p(x) = ab^x$ and $r(x) = cd^x$, then $p(x) \bullet r(x)$ equals

   1) $ac(b+d)^x$
   2) $ac(b+d)^{2x}$
   3) $ac(bd)^x$
   4) $ac(bd)^{x^2}$

$(ab^x)(cd^x)$

$ab^x cd^x$

$ac(b^x d^x)$

$ac(bd)^x$

2. Are the given functions inverses? Justify your answer.

$$f(x) = -6x$$
$$g(x) = \frac{1}{6}x$$

No $f(x)$ & $g(x)$ are not inverses of one another because $f(g(x)) \neq x$ and $g(f(x)) \neq x$. They would both need to equal x to be inverse functions.

$f(g(x)) = x$

$f(\frac{1}{6}x) \overset{?}{=} x$

$-6(\frac{1}{6}x) \overset{?}{=} x$

$-x \neq x$

& $g(f(x)) = x$

$g(-6x) \overset{?}{=} x$

$\cancel{-6(\frac{1}{6}x) \overset{?}{=} x}$

$\frac{1}{6}(-6x) \overset{?}{=} x$

$-1x = x$

$-x \neq x$

3. Which equation represents an odd function?

1) $y = \sin x$

Symmetric ~~Rotates~~ around the origin $(180°)$ ~~reflects~~

2) $y = \cos x$

3) $y = (x+1)^3$

4) $y = e^{5x}$

Level II Practice:

4. Given $f^{-1}(x) = -\frac{3}{4}x + 2$, which equation represents $f(x)$?

1) $f(x) = \frac{4}{3}x - \frac{8}{3}$

2) $f(x) = -\frac{4}{3}x + \frac{8}{3}$

3) $f(x) = \frac{3}{4}x - 2$

4) $f(x) = -\frac{3}{4}x + 2$

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

$x = \frac{-3}{4}y + 2$
$-2 \qquad\quad -2$

$4(x-2) = (-\frac{3}{4}y)4$

$\frac{4x-8}{-3} = \frac{-3y}{-3}$

$-\frac{4}{3}x + \frac{8}{3} = y\,(f(x))$

Watch your signs.

5. Find $(f-g)(x)$ given that $f(x) = 3x^2 - 4$ and $g(x) = x^2 - 8x + 4$.

$(f-g)(x) = f(x) - g(x)$

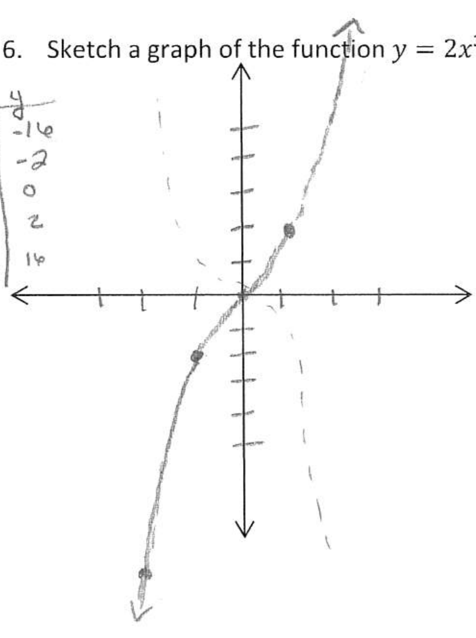
$3x^2 - 4 - (x^2 - 8x + 4)$

$3x^2 - 4 - x^2 + 8x - 4$

$2x^2 + 8x - 8$

6. Sketch a graph of the function $y = 2x^3$. Is the function odd, even, or neither? Explain your answer.

x	y
-2	-16
-1	-2
0	0
1	2
2	16



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

$-2x^3$

$f(-x) = -f(x)$

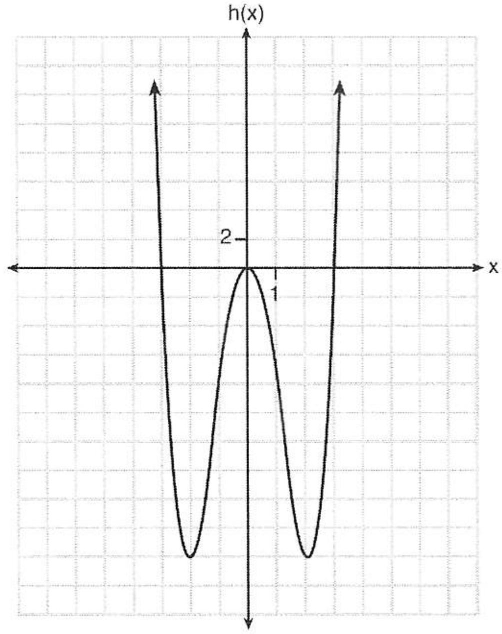
10. Functions *f*, *g*, and *h* are given below. Which statement is true about functions *f*, *g*, and *h*?

$$f(x) = \sin(2x)$$

$$g(x) = f(x) + 1$$

$f(x) = \sin(2x)$

$g(x) = f(x) + 1$



1) $f(x)$ and $g(x)$ are odd, $h(x)$ is even.

2) $f(x)$ and $g(x)$ are even, $h(x)$ is odd.

3) $f(x)$ is odd, $g(x)$ is neither, $h(x)$ is even.

4) $f(x)$ is even, $g(x)$ is neither, $h(x)$ is odd.

Level III Practice:

7. If $g(c) = 1 - c^2$ and $m(c) = c + 1$, then which statement is *not* true?

   1) $g(c) \cdot m(c) = 1 + c - c^2 - c^3$ ok $(1-c^2)(c+1) = c + 1 - c^3 - c^2 = 1 + c - c^2 - c^3$
   2) $g(c) + m(c) = 2 + c - c^2$ ok $(1-c^2) + (c+1) = 1 - c^2 + c + 1 = 2 + c - c^2$
   3) $m(c) - g(c) = c + c^2$ ok $(c+1) - (1-c^2) = c + 1 - 1 + c^2 = c + c^2$
   4) $\dfrac{m(c)}{g(c)} = \dfrac{-1}{1-c}$ $\quad \dfrac{c+1}{1-c^2} = \dfrac{c+1}{-1(c^2-1)} = \dfrac{\cancel{c+1}}{-1(\cancel{c+1})(c-1)} = \dfrac{-1}{c-1} \neq \dfrac{-1}{1-c}$

8. Which statement regarding the graphs of the functions below is *untrue*?

$$f(x) = 3\sin 2x, \text{ from } -\pi < x < \pi$$

$$g(x) = (x - 0.5)(x + 4)(x - 2)$$

$$h(x) = \log_2 x$$

$$j(x) = -|4x - 2| + 3$$

   1) $f(x)$ and $j(x)$ have a maximum y-value of 3. c
   2) $f(x)$, $h(x)$, and $j(x)$ have one y-intercept. $h(x)$ has no y-intercept
   3) $g(x)$ and $j(x)$ have the same end behavior as $x \to -\infty$. c $\quad g(x): x \to -\infty,\ y \to -\infty$ $\quad j(x): x \to -\infty,\ y \to -\infty$
   4) $g(x)$, $h(x)$, and $j(x)$ have rational zeros. c

9. Show the inverse of a linear function $y = mx + b$, where $m \neq 0$ and $x \neq b$, is also a linear function.

$$y = mx + b$$

$$x = my + b$$

$$-b \qquad -b$$

$$\frac{x - b}{m} = \frac{my}{m}$$

inverse

$$y = \frac{x}{m} - \frac{b}{m}$$ Still linear