Math 150, *Lecture Notes- Bonds* **Name_____**

Section P.3 *Functions and Their Graphs*

Ex.1 Evaluate the function and simplify: $f(x)=\begin{cases} x^2+2, & x\le 1 \\ 2x^2+2, & x>1 \end{cases}$,

find **(a)** $f(-2)$, **(b)** $f(0)$, **(c)** $f(1)$ and **(d)** $f(s^2+1)$

(a) $f(-2)=$ $(-2)^2+2$

$=4+2$

$f(-2)=6$

(b) $f(0)=$ $(0)^2+2$

$=0+2$

$=2$

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

$=1+2$

$=3$

(d) $f(s^2+1)=$ $2(s^2+1)+2$

$=2s^2+2+2$

$=2s^2+4$

Ex.2 Evaluate the function and simplify: $f(x)=x^3-x$, find $\dfrac{f(x)-1}{x-1}$

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

$$= \frac{x^3-x-1}{x-1}$$

Ex.3 Find the following functions:

(a) $f(x)+g(x)$, **(b)** $f(x)-g(x)$, **(c)** $f(x)\cdot g(x)$ and **(d)** $f(x)/g(x)$, given: $f(x)=x^2+5x+4$ and $g(x)=x+1$

(a) $f(x)+g(x)=$ $(x^2+5x+4)+(x+1)$

$= x^2+6x+5$

(b) $f(x)-g(x)=$ $(x^2+5x+4)-(x+1)$

$= x^2+5x+4-x-1$

$= x^2+4x+3$

Ex.3

(c) $f(x)\cdot g(x) = [x^2+5x+4]\cdot[x+1]$

$= (x^2)(x) + (x^2)(1) + (5x)\cdot(x) + (5x)\cdot(1) + (4)(x) + (4)\cdot(1)$

$= x^3 + x^2 + 5x^2 + 5x + 4x + 4$

$= x^3 + 6x^2 + 9x + 4$

(d) $f(x)/g(x) = \dfrac{(x^2+5x+4)}{(x+1)}$

$= \dfrac{(x+1)(x+4)}{(x+1)}$

$= x+4$

Ex.4 Find the following functions: **(a)** $(f\circ g)(x)$ and **(b)** $(g\circ f)(x)$,

given: $f(x)=\dfrac{x}{x-1}$ and $g(x)=\dfrac{-4}{x}$

(a) $(f\circ g)(x) = f(g(x))$

$= \dfrac{g(x)}{g(x)-1} = \dfrac{\frac{-4}{x}}{\frac{-4}{x}-1} = \dfrac{\left[\frac{-4}{x}\right]}{\left[\frac{-4}{x}-1\right]}\cdot\left(\dfrac{\frac{x}{1}}{\frac{x}{1}}\right)$

$= \dfrac{\frac{-4x}{x}}{\frac{-4x}{x}-\frac{x}{1}} = \dfrac{-4}{-4-x} = \dfrac{-1\cdot(4)}{-1\cdot(x+4)} = \dfrac{4}{x+4}$ ✓

(b) $(g\circ f)(x)$,

$= g(f(x))$

$= \dfrac{-4}{f(x)}$

$= \dfrac{-4}{\frac{x}{x-1}}$

$= \dfrac{-4}{1}\cdot\dfrac{x-1}{x}$

$= \dfrac{-4x+4}{x}$ ✓

Ex.5 determine whether the following functions are even, odd, or neither:

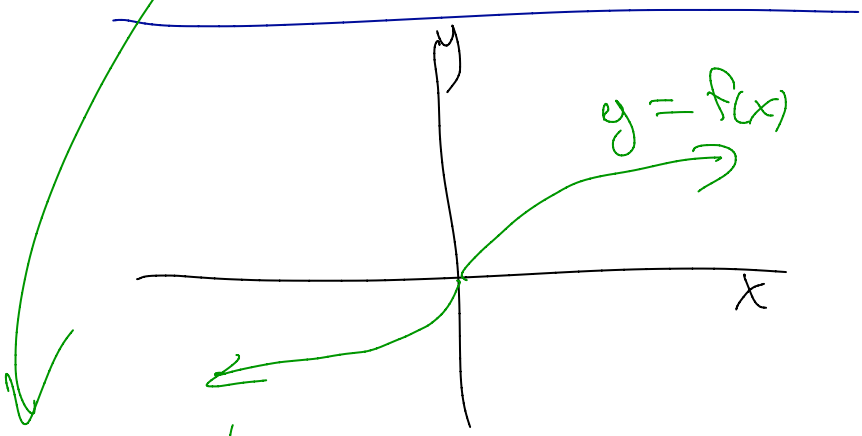
(a) $f(x)=\sqrt[3]{x}$ and **(b)** $g(x)=\sin^2(x)$

(a) $f(-x) = \sqrt[3]{(-x)}$

$f(-x) = -\sqrt[3]{x}$

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

f is odd



Symmetric About the origin

(b) $g(-x) = \sin^2(-x)$

$g(-x) = [\sin(-x)]^2$

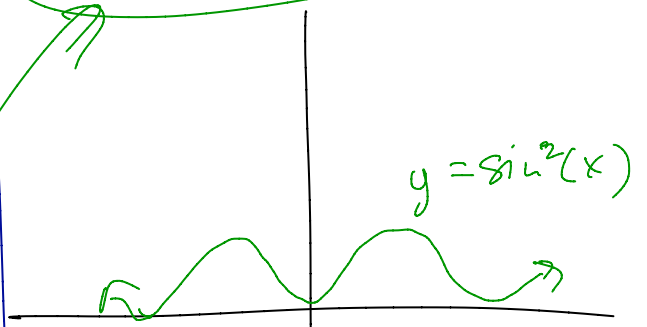
$g(-x) = [-\sin(x)]^2$

since the sine function is odd

$g(-x) = \sin^2(x)$

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

g is even



Symmetric About the y-AXIS