Please print this out and write your solutions on this document. I will only give half credit if the solutions are not written on this form. Please staple when finished. 60pts to earn here. Thanks!

Problem 24: (2pts) Find the domain of each function and express it using interval notation.

(a.) $g(x) = \frac{\sqrt{2+x}}{3-x}$,

(b.) $f(x) = \frac{(x+1)^2}{\sqrt{2x-1}}$,

Problem 25: (4pts) The difference quotient based at a for $f(x)$ is given by $\frac{f(a)-f(a+h)}{h}$ where $h \neq 0$. Calculate and simplify the difference quotient for the following functions:

(a.) $f(x) = 3x^2 + 2$,

(b.) $f(x) = \dfrac{x}{x+1}$,

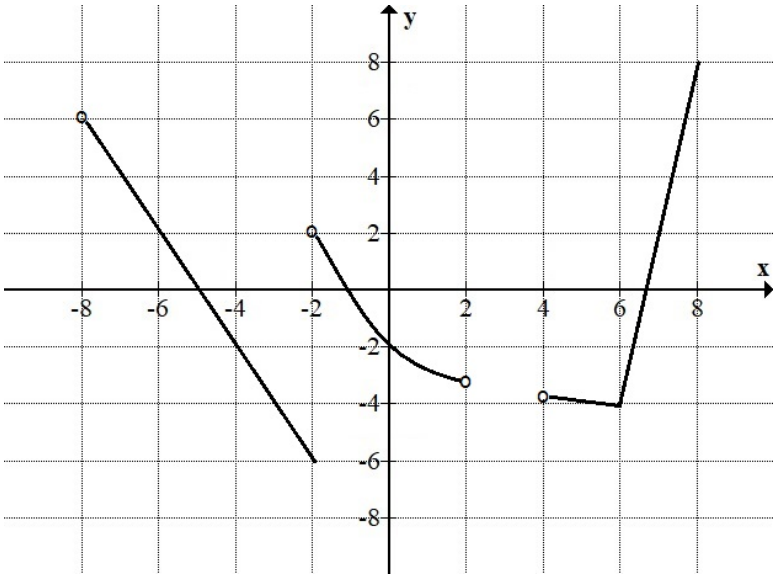
Problem 26: (4pts) Consider the graph $y = f(x)$ given below. Answer the following questions using interval notation (might need a union) where appropriate. Fill in the blanks:

(a.) the domain of $f(x) =$ _____.

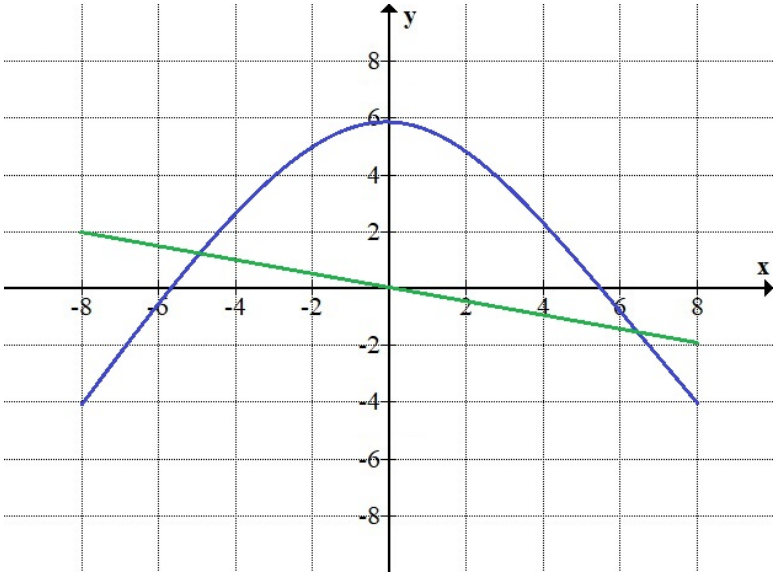
(b.) the range of $f(x) =$ _____.

(c.) $f(0) =$ _____.

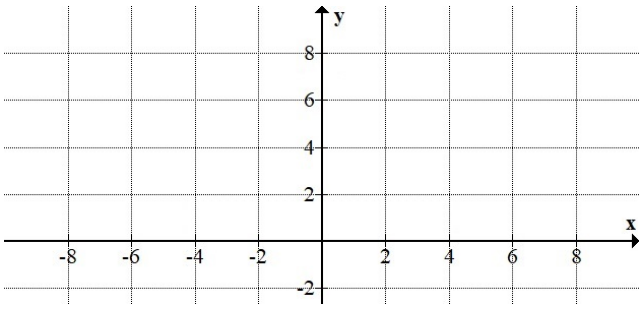
(d.) $f(3) =$ _____.



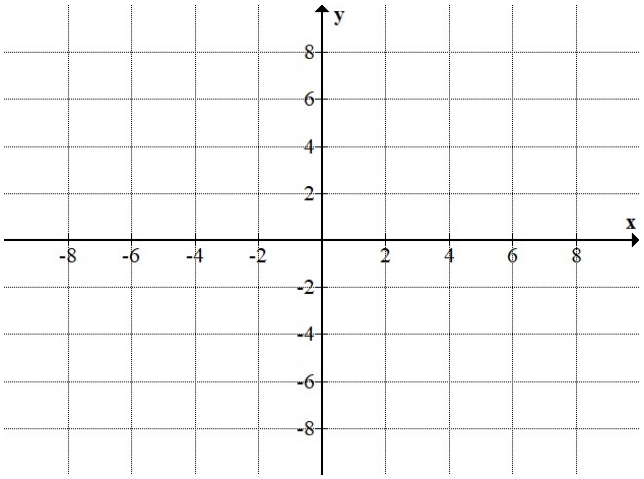
Problem 27: (2pts) Suppose $y = f(x)$ is the blue graph given below and $y = g(x)$ is the green graph given below. Please use a colored pen, crayon, marker (whatever you have with color) to give the graphs the color indicated in this pdf. Then, graph $y = f(x) + g(x)$ in red.



Problem 28: (2pts) Let $f(x) = 8 - \frac{1}{8}(x-2)^2$ for $-6 \leq x \leq 6$.
Graph $y = f(x)$ and find the range of this function.

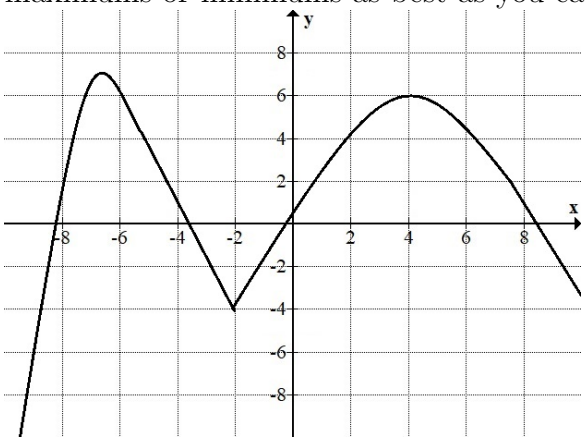


Problem 29: (2pts) Let $f(x) = \begin{cases} -2x - 6 & : -6 < x < 0 \\ \frac{1}{4}x^2 + 2 & : 0 \leq x \leq 3 \end{cases}$.
Graph $y = f(x)$ in the plot below and find the domain and range of $f(x)$.



Problem 30: (1pt) For the previous problem, calculate $f(-2)$ and $f(2)$.

Problem 31: (3pts) Find the intervals of increase and the intervals of decrease. Also find any local maximums or minimums as best as you can given the plot below:



Problem 32: (2pts) Consider the function $f(x) = x(x+2)(x-2)(x+4)(x-4)$. Sketch the graph $y = f(x)$ and determine how many local minimums and maximums are found on the graph.

Problem 33: (3pts) Consider $f(t) = t^2 + 3$ for $-5 \leq t \leq 5$. Find:

(a.) the average rate of change from $t = -3$ to $t = -2$ is _____.

(b.) the average rate of change from $t = 1$ to $t = 3$ is _____.

(c.) sketch $y = f(t)$ in the ty-plane and explain where the function is increasing and where it is decreasing. Do your answers to (a.) and (b.) make sense ?

Problem 34: (6pts) Suppose $f(2) = 3$ and $g(2) = 7$ and $g(3) = 10$ and $f(7) = 0$. Calculate the following:

(a.) $(f+g)(2) =$ _____.

(b.) $(f-g)(2) =$ _____.

(c.) $(fg)(2) =$ _____.

(d.) $\left(\frac{f}{g}\right)(2) =$ _____.

(e.) $(f \circ g)(2) =$ _____.

(f.) $(g \circ f)(2) =$ _____.

Problem 35: (4pts) Let $f(x) = \sqrt[3]{x+6}$ and $g(x) = \sqrt{2x-9}$. Find the domain and formula for each of the following: notice f/g is another notation for $\frac{f}{g}$ just like $2/3$ can be written $\frac{2}{3}$.

(a.) $(f+g)(x) =$ _____. and $\text{dom}(f+g) =$ _____.

(b.) $(f/g)(x) =$ _____. and $\text{dom}(f/g) =$ _____.

Problem 36: (2pts) Let $f(x) = \sqrt{-x}$ and let $g(x) = \sqrt{2+x}$. Find the domain and formula for $f+g$.

Problem 37: (1pts) Suppose a graph in the xy-plane is defined by $x^2 - 6x + y^2 + 8y = 0$. Can we view the graph of the equation as the graph of a function $y = f(x)$.

Problem 38: (1pts) Suppose a graph in the xy-plane is defined by $x^2y + 2 = y$. Can we view the graph of the equation as the graph of a function $y = f(x)$.

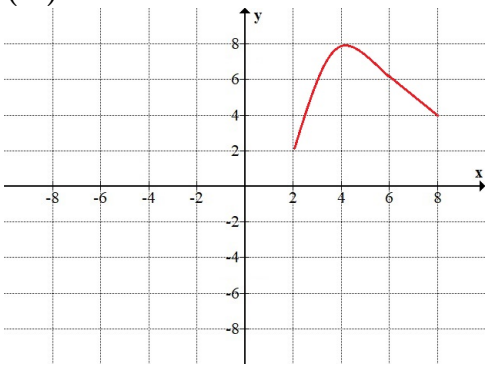
Problem 39: (3pts) Begin with $y = f(x)$ and provide a sequence of transformations which produces the graph $y = g(x)$ given that:

(a.) $f(x) = |x|$ and $g(x) = 3 - |x - 4|$

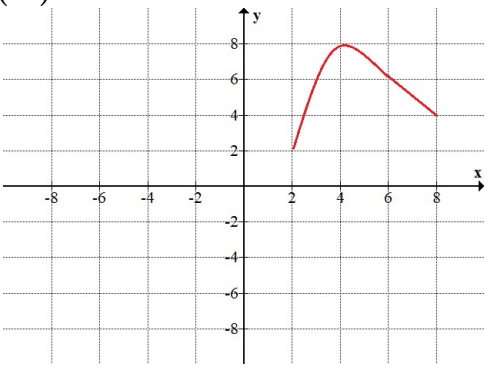
(b.) $f(x) = \sqrt{x}$ and $g(x) = 2\sqrt{3-x}$

Problem 40: (2pts) Finish drawing the graphs under the assumption:

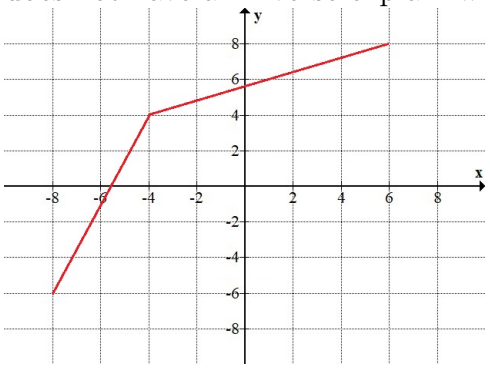
(a.) the function is even

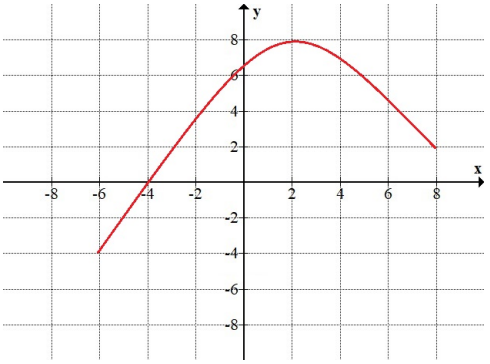


(b.) the function is odd.



Problem 41: (2pts) If possible, graph the inverse function for each function graph below. If the function does not have an inverse explain why.





Problem 42: (1pts) Let $f(x) = \dfrac{1}{3x+2}$. Show $f(x)$ is a one-to-one functionby showing that $f(a) = f(b)$ implies $a = b$.

Problem 43: (4pts) For each formula given below identify an outside function $f(x)$ and an inside function $g(x)$ for which:

(a.) $(f \circ g)(x) = \sqrt{x^2+3x+2}$ has $f(x) =$ _____ and $g(x) =$ _____.

(b.) $(f \circ g)(x) = \dfrac{1}{3+\sqrt{x}}$ has $f(x) =$ _____ and $g(x) =$ _____.

(c.) $(f \circ g)(x) = 2 + (3+\sqrt{x})^3$ has $f(x) =$ _____ and $g(x) =$ _____.

(d.) $(f \circ g)(x) = \dfrac{1}{(3x-7)^2}$ has $f(x) =$ _____ and $g(x) =$ _____.

Problem 44: (1pts) Suppose f is an invertible function and $f(2) = 3$. Calculate $f^{-1}(3)$.

Problem 45: (8pts) Given the function $f(x)$ calculate the formula for $f^{-1}(y)$.

(a.) $f(x) = 3x - 8$

(b.) $f(x) = 3 - \dfrac{1}{x-2}$

(c.) $f(x) = x^2 + 6$ given that $x \geq 0$

(d.) $f(x) = 6 + \dfrac{1}{\sqrt[3]{x-4}}$