

You are allowed one page of notes and a calculator. No phones. More than 150pts to earn. Thanks!

Problem 1: (9pts) Suppose $f(2) = 20$ and $g(2) = 2$, and $g(20) = 11$. Calculate the following:

(a.) $(f + g)(2) = \underline{\hspace{2cm}}$.

(b.) $(fg)(2) = \underline{\hspace{2cm}}$.

(c.) $(g \circ f)(2) = \underline{\hspace{2cm}}$.

Problem 2: (15pts) Consider the graph $y = f(x)$ given below. Answer the following questions using interval notation where appropriate. Fill in the blanks:

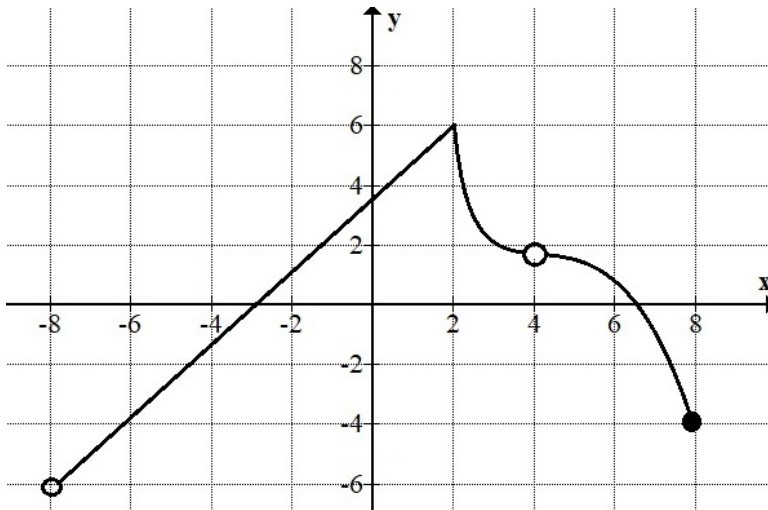
(a.) the domain of $f(x) = \underline{\hspace{2cm}}$.

(b.) the range of $f(x) = \underline{\hspace{2cm}}$.

(c.) $f(4) = \underline{\hspace{2cm}}$.

(d.) $f(2) = \underline{\hspace{2cm}}$.

(e.) If $g(x) = x^2 + 4$ the calculate $(f \circ g)(2) = \underline{\hspace{2cm}}$.



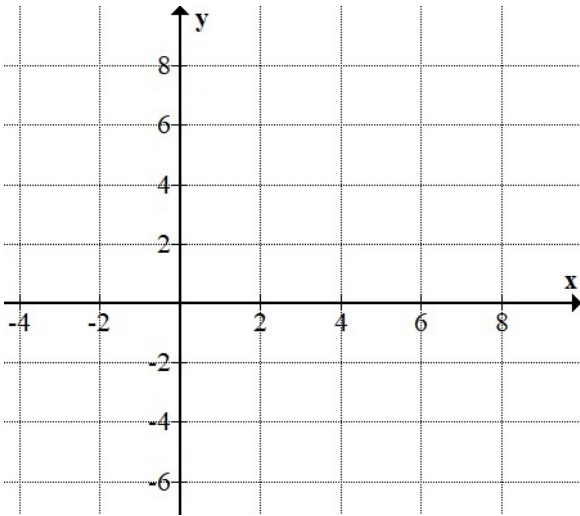
Problem 3: (6pts) Let $f(x) = \begin{cases} 2x^2 + 3 & : -2 < x < 1 \\ \sqrt{x + 14} & : 1 \leq x \leq 3 \end{cases}$.

Given the function above, calculate:

(a.) $f(2) = \underline{\hspace{2cm}}$.

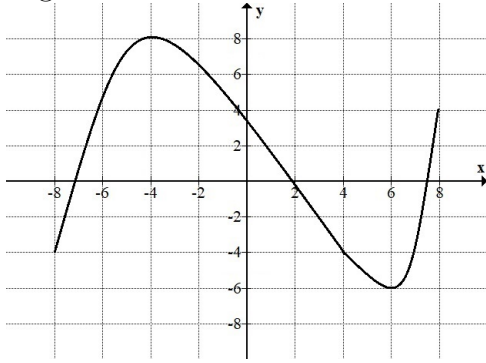
(b.) $f(-1) = \underline{\hspace{2cm}}$.

Problem 4: Let $f(x) = x^2 - 4x$. Carefully graph $y = f(x)$ on the grid provided below (10pts). Also, find the range of the function and write it in interval notation (5pts).



Problem 5: (15pts) The difference quotient based at a for $f(x)$ is given by $\frac{f(a+h)-f(a)}{h}$ where $h \neq 0$. Calculate and simplify the difference quotient for $f(x) = \frac{1}{x+3}$.

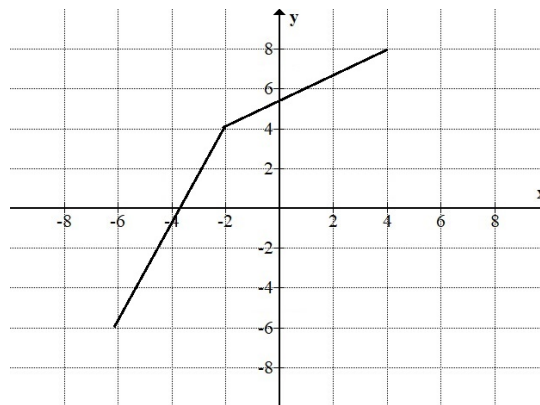
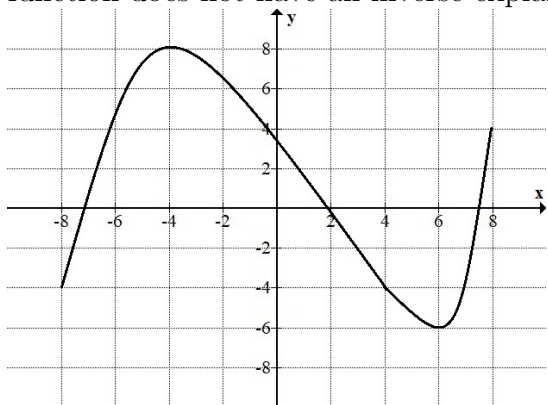
Problem 6: (10pts) Find the average rate of change from $x = 6$ to $x = 8$ for the function whose graph is given below:



Problem 7: (10pts) Given $f(x) = \sqrt{-x}$ and $g(x) = \sqrt{6 + 2x}$, calculate the formula for $(f + g)(x)$ and find the domain of $f + g$.

Problem 8: (10pts) For the functions given above, find the formula and domain for f/g .

Problem 9: (12pts) If possible, graph the inverse function for each function graph below. If the function does not have an inverse explain why.



Problem 10: (18pts) Let $f(x) = (x + 2)^3$ and $g(x) = \frac{1}{3 - x}$. Find the formulas for:

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

(b.) $(g \circ f)(x) =$

(c.) $(f \circ f)(x) =$

Problem 11: (10pts) Consider the graph $y = (x + 6)(x + 2)^2(x - 3)(x - 7)$. Sketch the graph and determine the number of local maximums as well as the number of local minimums.

Problem 12: (10pts) Consider the graph of $yx - x^2 = yx^3$. Is this the graph of a function ?

Problem 13: (12pts) Given the function $f(x) = 41 + \frac{x}{x-3}$ calculate the formula for $f^{-1}(y)$.

Problem 14: (8pts) Find the domain and range $f(x)$ given in the previous problem.