EXAM 1 - MATH 111 Friday, September 16

YOUR NAME:_____ George Voutsadakis

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. (a) Given the function $f(x) = x^2 - 3x$:

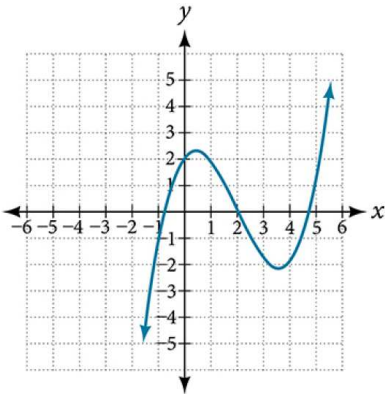
   (i) Evaluate $f(5)$.

   (ii) Solve $f(x) = 4$.

   (b) Given the function $y = f(x)$ whose graph is shown:

   (i) Evaluate $f(5)$.

   (ii) Solve $f(x) = 2$.



   (c) Given the function $y = f(x)$ determined by the following table:

x	0	1	2	3	4	5
$f(x)$	8	5	1	3	5	9

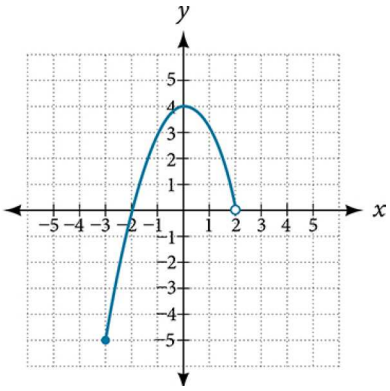
   (i) Evaluate $f(1)$.

   (ii) Solve $f(x) = 5$.

2. (a) Find the domain of $f(x) = \dfrac{x-5}{3-10x}$.

(b) Find the domain of $g(x) = \sqrt{3x+12}$.

(c) Given the function shown below, write clearly its domain and range in interval notation.



3. Suppose that a certain country follows the following progressive individual taxation scheme. If a person earns up to \$30,000, they are taxed at the rate of 15%. Income in excess of \$30,000 and up to \$60,000 is taxed at 20% and all income in excess of \$60,000 is taxed at 25% rate.

(a) Write a piece-wise defined function for the amount $T(x)$ of tax that is owed by an individual as a function of his/her income x.

(b) Compute the tax owed by an individual earning \$40,000.

(c) Compute the tax owed by an individual earning \$90,000.

4. (a) Compute the average rate of change of $f(x) = 7 - x^2$ on $[2, 5]$.

(b) Let $f(x) = \dfrac{1}{3x - 1}$ and $g(x) = \dfrac{1}{5 - x}$. Find the following and simplify:

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

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

5. (a) Starting from $y = f(x)$, outline the transformations performed in sequence to produce $g(x) = 2f(x+1) + 3$.

$y = f(x) \longrightarrow y =$ ( )

$\longrightarrow y =$ ( )

$\longrightarrow y = 2f(x+1) + 3$ ( )

(b) Assuming that the graph of $y = f(x)$ is given in the figure, sketch the graph of $g(x) = 2f(x+1) + 3$.