MT110: Calculus and Analytic Geometry

Worksheet 10

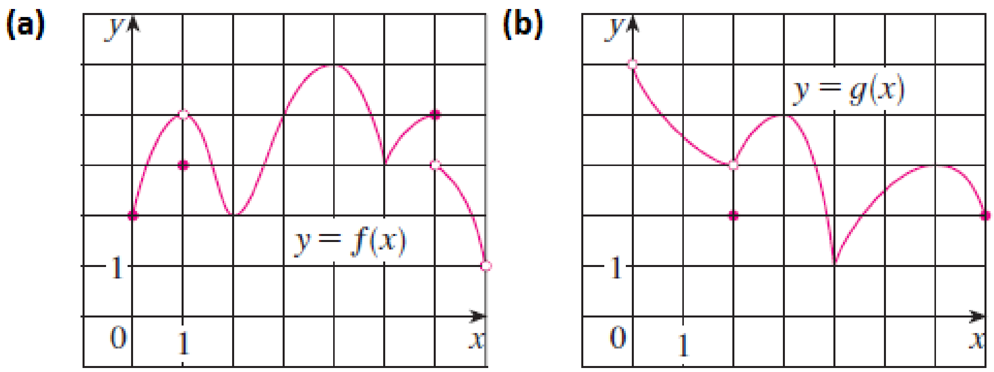
Due 4:30 pm, Fri Nov 16 *fall 2018*

Roll# Student 1: ______________________ Roll# Evaluator 1: ______________________

Roll# Student 2: ______________________ Roll# Evaluator 2: ______________________

Problem 1 [10 Marks]

Use the graph to state the absolute and local maximum and minimum values of the function. In case no such value exists, give a reason.



Problem 2 [10 Marks]

Find the critical points of the function.

a) $f(x) = 2x^3 - 3x^2 - 36x$ [5 Marks]

b) $y = |\cos x|$ for $x \in [-\pi, \pi]$ [5 Marks]

Problem 3 [20 Marks]

Find the absolute maximum and absolute minimum values of f on the given interval.

a) $f(x) = 2x^3 - 3x^2 - 36x$ [5 Marks]

b) $y = |\cos x|$ for $x \in [-\pi, \pi]$ [5 Marks]

c) $y = 12 + 4x - x^2$, $[0, 5]$ [5 Marks]

d) $y = x + \dfrac{1}{x}$, $[0.2, 4]$ [5 Marks]

Problem 4 [10 Marks]

Between 0 °C and 30 °C, the volume V (in cubic centimeters) of 1 kg of water at a temperature T is given approximately by the formula

$$V = 20 - 15T + 6T^2 + T^3$$

Find the temperature at which water has its maximum density. (density=mass/volume)

Problem 5 [10 Marks]

Verify that the function satisfies the three hypotheses ('if' conditons) of Rolle's theorem on the given interval. Then find all numbers c that satisfy the conclusion of Rolle's theorem.

a) $y = 5 - 12x + 3x^2$, $[1, 3]$ [5 Marks]

b) $y = \cos(2x)$, $\left[\frac{\pi}{8}, \frac{7\pi}{8}\right]$ [5 Marks]

Problem 6 [10 Marks]

Verify that the function satisfies the hypotheses ('if' conditons) of the mean value theorem on the given interval. Then find all numbers c that satisfy the conclusion of the mean value theorem.

a) $y = 2x^2 - 3x + 1$, $[0, 2]$ [5 Marks]

b) $y = \frac{1}{x}$, $[1, 3]$ [5 Marks]

Problem 7 [10 Marks]

Suppose the derivative of a function f is $f'(x) = (x+1)^2(x-3)^5(x-6)^4$.

a) On what interval(s) is f increasing?

b) On what interval(s) is f decreasing?

c) Find all the local maxima and local minima?

d) Sketch $f(x)$ for the interval $[-10, 10]$.
