MATH 1500 D01/D02 Fall 2015 Assignment 1

SHOW ALL WORK to get full marks. Leave answers as exact answers. For example, leave it as 1/7 as opposed to 0.142857. Word problems should have sentence answers with units. This assignment covers sections 1.1, 1.3, 1.5, 1.6, 2.1, 2.2, and 2.3.

1. For the following functions, simplify $\dfrac{f(a+h) - f(a)}{h}$ as much as possible.

[4]   (a) $f(x) = x^2 + 6x - 4$

[4]   (b) $f(x) = \dfrac{x+1}{x-1}$

2. For the function f defined by $f(x) = x^2 - 3$:

[3]   (a) Find an interval (as large as possible) such that f is one–to–one.

[4]   (b) Find the inverse of f on the interval from part (a).

[3]   (c) State the domain and range of f and f^{-1} using the restriction from part (a).

3. Solve the following equations.

[4]   (a) $\log_3 x + \log_3(2x+1) = 1$

[5]   (b) $\left(\sqrt[3]{2}\right)^{x+10} = 2^{x^2}$

[3]   (c) $\dfrac{e^{x^2}}{e^{x+6}} = 1$

[4] 4. (a) Sketch the graph
$$f(x) = \begin{cases} (x+1)^2 & x < -1 \\ -x & -1 \leqslant x < 1 \\ \sqrt{x-1} & x \geqslant 1 \end{cases}$$

[7]   (b) Find the following limits if they exists. If they don't exist, explain why
$$\lim_{x \to -1^-} f(x) \quad \lim_{x \to -1^+} f(x) \quad \lim_{x \to -1} f(x) \quad \lim_{x \to 0} f(x) \quad \lim_{x \to 1^-} f(x) \quad \lim_{x \to 1^+} f(x) \quad \lim_{x \to 1} f(x)$$

5. Find the following limits if they exist. If they don't exist, determine whether the limit is ∞, $-\infty$ or neither.

[1]   (a) $\displaystyle\lim_{x \to 3} \dfrac{x^2 + 3x - 10}{3x^2 + 5x - 7}$

[3]   (b) $\displaystyle\lim_{x \to 3} \sqrt{\dfrac{x^2 - 2x - 3}{x - 3}}$

[4]   (c) $\displaystyle\lim_{x \to 0} \dfrac{\sqrt{x^2 + 4} - 2}{x}$

[4]   (d) $\displaystyle\lim_{x \to 0} \dfrac{\tan 5x}{\tan 2x}$

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[4]   (e) $\displaystyle\lim_{x\to 5}\frac{2x-10}{|x-5|}$

[3]   (f) $\displaystyle\lim_{x\to 0^+} x^4 \sin\left(\frac{1}{\sqrt[3]{x}}\right)$

This assignment is out of 60 points.