

MATH 1500 D01/D02 Summer 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.

1. For the following functions, simplify $\frac{f(a+h) - f(a)}{h}$ as much as possible. (At minimum, neither answer should have a factor of h when you are done.)

[4] (a) $f(x) = x^2 + 3x + 5$

[4] (b) $f(x) = \frac{1}{\sqrt{3x+5}}$

2. For the function f defined by $f(x) = x^2 - 4x + 5$:

[2] (a) Put the function in the form $f(x) = (x-h)^2 + k$.

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

[2] (c) Find the inverse of f on the interval from part (b).

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

3. Solve the following equations. If there are any logarithms in the final answer, they should be the natural logarithm.

[4] (a) $\log_2(x+5) + \log_2(2x-2) = 5$

[5] (b) $3^{x+5} = 5(2^{2x+7})$

[3] (c) $e^{2x} + 5e^x - 14 = 0$

- [4] 4. (a) Sketch the graph

$$f(x) = \begin{cases} x^2 - 2 & x < -1 \\ 3 & x = -1 \\ 3x + 2 & -1 < x \leq 3 \\ x^2 & x > 3 \end{cases}$$

- [7] (b) Find the following limits if they exist. If they don't exist, explain why

$$\lim_{x \rightarrow -1^-} f(x) \quad \lim_{x \rightarrow -1^+} f(x) \quad \lim_{x \rightarrow -1} f(x) \quad \lim_{x \rightarrow 0} f(x) \quad \lim_{x \rightarrow 3^-} f(x) \quad \lim_{x \rightarrow 3^+} f(x) \quad \lim_{x \rightarrow 3} f(x)$$

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

[1] (a) $\lim_{x \rightarrow 1} \frac{x^2 + 2x}{x^2 + 3x + 4}$

[3] (b) $\lim_{x \rightarrow 1^+} \frac{x^3 + 2x^2 + 4x - 7}{x^2 - 1}$ (Hint: If $x = 1$ makes a polynomial equal to 0 then what must be a factor?)

[4] (c) $\lim_{x \rightarrow 2} \frac{\sqrt{x} - \sqrt{4-x}}{x^2 + 2x - 8}$

$$[4] \quad (\text{d}) \quad \lim_{x \rightarrow 2^+} \frac{x^2 - 3x + 2}{x^2 - 4x + 4}$$

$$[4] \quad (\text{e}) \quad \lim_{x \rightarrow 3} \frac{x^2 + 4x - 21}{|2x - 6|}$$

$$[3] \quad (\text{f}) \quad \lim_{x \rightarrow 0^+} x \sin\left(\frac{2}{x^2}\right)$$

This assignment is out of 60 points.