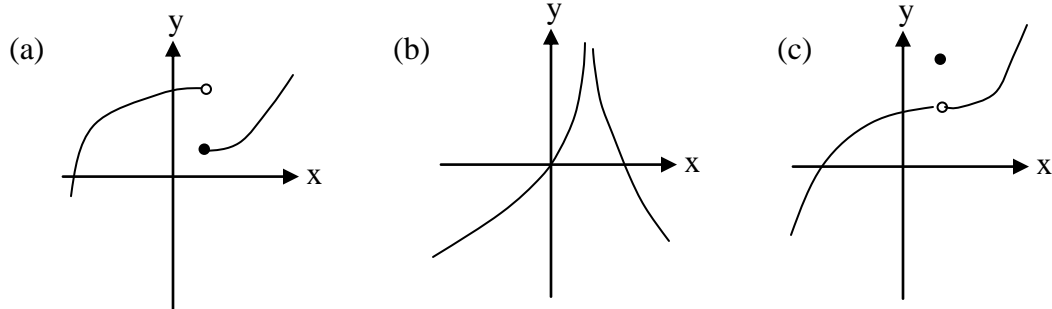# Assignment 2          MATH 1500

## (Follows Unit 7 in the manual)

## Values

[6]     1. Each of the following graphs contains a discontinuity.  Determine whether the discontinuity is (i) a removable discontinuity (ii) a jump discontinuity or (iii) an infinite discontinuity  [cf. Section 2.5]

(a)

(b)

(c)

[5]     2. For what value of a is

$$f(x) = \begin{cases} x^2 - 1, & x < 3 \\ 2ax, & x \geq 3 \end{cases}$$

continuous at every $x$ ?

[6]     3. Show that the function $f(x) = x^3 - 4x + 2$ has two zeros in the interval [0, 2]. [cf. Section 2.5]

[4]     4. Consider the function $f(x) = \begin{cases} 5x + c & \text{if } x \leq 2 \\ x^2 + 4 & \text{if } x > 2 \end{cases}$.  For what value of $c$ will this function be continuous at $x = 2$?   [cf. Section 2.5]

[8]     5. Evaluate the following limits.

(a) $\lim\limits_{x\to-\infty} \dfrac{\sqrt{7x^2+2x}}{2x+1}$          (b) $\lim\limits_{x\to\infty}\left(\sqrt{9x^2+x}-3x\right)$       [cf. Section 2.6]

[9]     6. Find the horizontal and vertical asymptotes of $f(x)=\dfrac{\sqrt{9x^2+x}}{2x+1}$ .

       [cf. Section 2.6]

[6]     7. Find an equation of the tangent line to the curve $y=\sqrt{x+5}$ at the point (4, 3).
       [cf. Sections 2.7 and 2.8]

[6]     8. Use the definition of the derivative to find the derivative of $f(x)=\dfrac{1}{5x}$.

       [cf. Sections 2.8 and 2.9]

[15]    9. Find the derivatives of the following functions. Do **not** use the definition of
the derivative. You need not simplify your answers.
[cf. Sections 3.1, 3.2 and 3.4]

(a) $f(x)=5x^{2/5}+6\sqrt{x}+e^{x}+\pi^{5}$

(b) $f(x)=(\sin x+e^{x})(\sqrt{x}+\cos x)$

(c) $f(x)=\dfrac{4\sqrt{x}+3\sin x}{x^3+2e^{x}}$

[5]     10. Evaluate $\lim\limits_{x\to0}\dfrac{\sin 4x}{3x}$ . [cf. Section 3.4]

**Total = 70**