

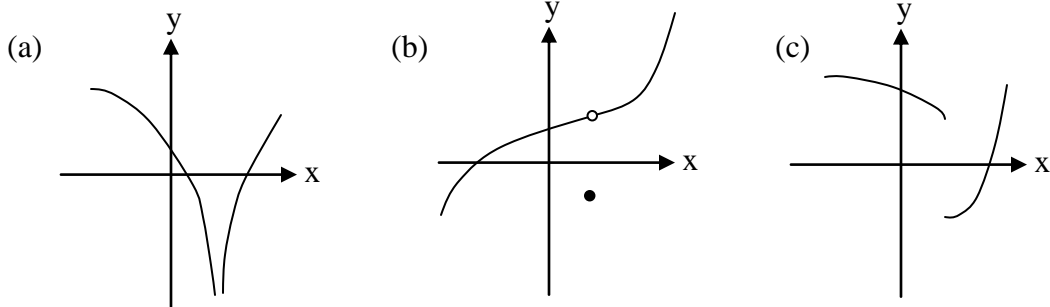
Assignment 2

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]



- [6] 2. Each of the following functions contains a discontinuity at $x = -1$. Determine whether the discontinuity at $x = -1$ is (i) a removable discontinuity (ii) a jump discontinuity or (iii) an infinite discontinuity [cf. Section 2.5]

(a) $f(x) = \frac{x^2 + 1}{x + 1}$

(b) $f(x) = x + 1$

(c) $f(x) = \frac{x^2 - 1}{x + 1}$

- [6] 3. Show that the function $f(x) = x^5 - 3x + 1$ has at least three zeros in the interval $[-2, 2]$.
[cf. Section 2.5]

- [6] 4. 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 ?

[8] 5. Evaluate the following limits.

(a) $\lim_{x \rightarrow -\infty} \frac{\sqrt{7x^2 + 2x}}{2x + 1}$ (b) $\lim_{x \rightarrow \infty} (\sqrt{9x^2 + x} - 3x)$ [cf. Section 2.6]

[9] 6. Find the horizontal and vertical asymptotes of $f(x) = \frac{\sqrt{x^2 + 2x}}{2x - 3}$.
[cf. Section 2.6]

[6] 7. Find an equation of the tangent line to the curve $y = \sqrt{x+1}$ at the point (3, 2).
[cf. Sections 2.7 and 2.8]

[6] 8. Use the definition of the derivative to find the derivative of $f(x) = \frac{1}{3x}$.
[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) $f(x) = 2x^{5/2} + 4\sqrt{x} + e^x + \pi^3$

(b) $f(x) = (3x^5 + e^x)(2\sqrt{x} + \cos x)$

(c) $f(x) = \frac{4x^{1/2} + 2\sin x}{x^3 + 3x}$

[5] 10. Evaluate $\lim_{x \rightarrow 0} \frac{\sin 5x}{2x}$. [cf. Section 3.4]

Total = 70