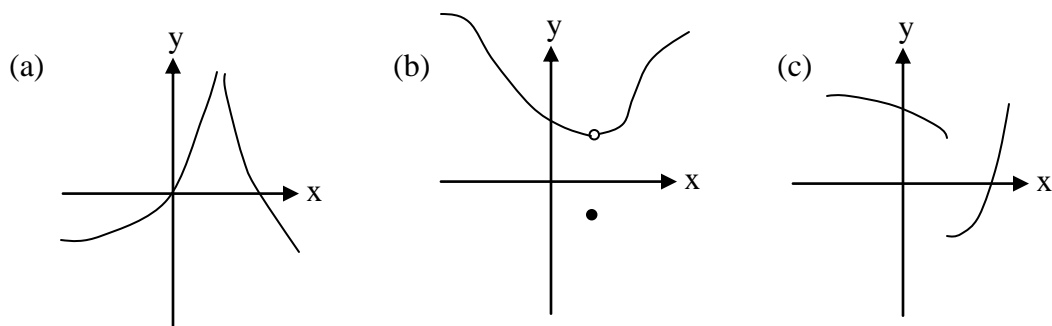


Assignment 2

(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 $x = 3$. Determine whether the discontinuity at $x = 3$ is (i) a removable discontinuity (ii) a jump discontinuity or (iii) an infinite discontinuity [cf. Section 2.5]

(a) $f(x) = \frac{x^2 + 9}{x - 3}$ (b) $f(x) = \frac{x^2 - 9}{x - 3}$

- [5] 3. Show that the function $f(x) = x^3 - 15x + 1$ has three zeros in the interval $[-4, 4]$. [cf. Section 2.5]

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

- [8] 5. Evaluate the following limits.

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

- [9] 6. Find the horizontal and vertical asymptotes of $f(x) = \frac{\sqrt{9x^2 + x}}{2x+1}$.
[cf. Section 2.6]
- [6] 7. Find an equation of the tangent line to the curve $y = \sqrt{x+3}$ at the point (1, 2).
[cf. Sections 2.7 and 2.8]
- [6] 8. Use the definition of the derivative to find the derivative of $f(x) = \frac{2-x}{2+x}$.
[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) $f(x) = 4x^{2/3} - 5\sqrt{x} + e^x + \pi^3$
- (b) $f(x) = (3x^4 + e^{-x})(x^{1/3} + 3\sin x)$
- (c) $f(x) = \frac{6x^{2/3} + 2\tan x}{2x^3 - 4x}$
- [5] 10. Evaluate $\lim_{x \rightarrow 0} \frac{\sin(2x)}{\tan x}$. [cf. Section 3.4]

Total = 70