CHAPTER 1: INTRO TO CALCULUS

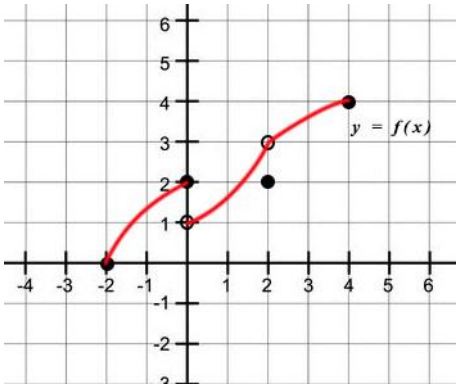
Test 2

Part A: Knowledge and Understanding (24 marks)

1) *Evaluate each limit* (3 *marks each*)

$a)\ \lim\limits_{x\to 4}\ \frac{4-\sqrt{12+x}}{x-4}$ $b)\ \lim\limits_{x\to 4}\ \frac{\sqrt{8-x}-2}{1-\sqrt{5-x}}$ $c)\ \lim\limits_{h\to 0}\ \frac{\frac{1}{x+h}-\frac{1}{x}}{h}$ $d)\ \lim\limits_{x\to 0}\ \frac{(x+216)^{\frac{1}{3}}-6}{x}$

2) *Using the graph of the function* $f(x)$ *below, determine each of the following*: (8 *marks*)



$a)\ \lim\limits_{x\to 2^+}\ f(x)$ $b)\ f(2)$ $c)\ f(0)$

$d)\ \lim\limits_{x\to -2^+}\ f(x)$ $e)\ \lim\limits_{x\to 2}\ f(x)$ $f)\ \lim\limits_{x\to 4^-}\ f(x)$

3) *Find the slope of the tangent to the curve* $y=\frac{x}{x^2-3}$ *at* $x=2$. (4 *marks*)

Part B: Application (13 marks)

1) *Determine the equation of the tangent to* $f(x)=\sqrt{x+2}$ *when* $x=-1$. (4 *marks*)

2) *Find the equation of the line that passes through* $(2,2)$ *and is parallel to the line tangent to* $f(x)=-3x^3-2x$ *at* $(-1,5)$. (4 *marks*)

Test 2

3) *Sketch any function that satisfies the following conditions:* (5 *marks*)

$$f(2) = 4, \quad \lim_{x \to 2^-} f(x) = 7, \quad \lim_{x \to 2^+} f(x) = -5 \quad f(x) \text{ decreases when } x > 2$$

Part C: Communication (12 marks)

1) *Explain why the function* $f(x) = \frac{2x^2+7x+3}{x^2-9}$ *is discontinuous at* $x = -3$. (3 *marks*)

2) *Suppose the* $\lim_{x \to a} f(x)$ *exists at point a. Does this condition guarantee that the function* $f(x)$ *is continuous at* $x = a$? *Illustrate your explanation with an example.* (3 *marks*)

3) *What do the following indicate about the graph of* $f(x)$? *Explain.* (2 *marks each*)

a) $\frac{f(2+3)-f(2)}{3} = 7$

b) $\lim_{h \to 0} \frac{f(2+h)-f(2)}{h} = 9$

Part D: Thinking (10 marks)

1) *Find the coordinates of the point where the tangent to* $f(x) = x^3 + 3x$ *is perpendicular to the line* $x + 3y - 12 = 0$. (6 *marks*)

2) *Determine the values of a and b so that the function* $f(x)$ *is continuous.* (4 *marks*)

$$f(x) = \begin{cases} ax + b & x < -2 \\ x^2 + 2ax - b & -2 \le x < -1 \\ 4 & x \ge -1 \end{cases}$$