

First Name: _____ Last Name: _____ Student ID: _____

Test 1**/51****Show your work!****1. Compute each limit.****(12marks)**

(a) $\lim_{x \rightarrow 1} \frac{1-x^3}{x^4-1}$	(d) $\lim_{x \rightarrow -1} \frac{x-1}{x+1}$
(b) $\lim_{x \rightarrow -\infty} \frac{-2x^3-7}{3x^2+1}$	(e) $\lim_{x \rightarrow 2} \frac{x-2}{x+2}$
(c) $\lim_{x \rightarrow 4} \frac{\sqrt{5-x}-1}{x-4}$	(f) $\lim_{x \rightarrow -\infty} (-2x^3 + 17x^2 + x + 3)$

2. For each case find $f'(x)$:

(12marks)

(a) $f(x) = \frac{x-1}{x+1}$	(d) $f(x) = e^x(x^3+x^2-1)$
(b) $f(x) = 2^x + x^2$	(e) $f(x) = \ln(e^x)$
(c) $f(x) = \sin^2(x^2+1)$	(f) $f(x) = \ln(\cos x)$

3. Use the first principles to find the derivatives of $f(x) = x^2 + 2x - 3$. (3marks)

(6marks)

4. For each case, use the first derivative sign to find the intervals of increase or decrease, LM, Lm.

(a) $f(x) = x^2 - 2x$

(b) $f(x) = x^3(x - 1)^4$

5. Find the intervals of concavity and the points of inflection for $f(x) = x^2 - 4x + 3$. (3marks)

(3marks)

6. Find a function f such that $f'(x) = 6x^2 - 12x + 6$ and $(1, 3)$ is a point of inflection of the graph of f .

(3marks)

7. Find the equation of the tangent line to the curve defined by $x^2 + xy + y^2 = 7$ at the point $(1, -3)$.

8. What is the maximum slope of a tangent to the curve $y = -x^3 + 3x^2 + 9x - 27$? (3marks)

(3marks)

9. Find the points on the curve $y = x^3 - 3x^2$ at which the tangent is parallel to the line $y = 9x + 7$.

10. Find the dimensions of the rectangle of largest area that has its base on the x-axis and its other two vertices above x-axis and lying on the parabola $y = 8 - x^2$. (3marks)

Bonus question

11. The diagonals of a quadrilateral are perpendicular. The sum of the diagonals is 8 cm.

What is the maximum area of such quadrilateral?

(3marks)