

MATH6040: Sample Test 2

Name:

Student Number:

Answer all questions. Marks may be lost if necessary work is not clearly shown.

1. A curve is defined parametrically by

$$x = t - t^2, \text{ and } y = t - t^3.$$

What is the slope at the point $(-2, 0)$.

[5 Marks]

2. Consider the function given by

$$z(x, y) = x^2y - 2xy^2 + 2xy + 5x^4.$$

Find $\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$ and $\frac{\partial^2 z}{\partial x \partial y}$.

[5 Marks]

3. Use implicit differentiation to find the equation of the tangent line to the curve

$$x^2 - xy + y^2 = 7$$

at the point $(2, -1)$.

[10 Marks]

4. The power P consumed in a resistor is given by

$$P = \frac{V^2}{R},$$

where V is the voltage and R is the resistance across the resistor.

- (i) Use partial derivatives and differentials to determine an approximate expression for ΔP , the change in the power P .
- (ii) Find the *approximate* change in P when V is changed by 5% and R is decreased by 0.5%.

[8 Marks]

5. How fast is the surface area of a cube changing when the volume of the cube is 64 cm^3 and increasing at $2 \text{ cm}^3/\text{s}$?

[12 Marks]