Name . . . . . .

Department . . . . . .

Whilst answering the test you may use the Formula Sheet and a university-approved calculator but please do NOT consult the Module or any book.

MODULE 3 Differentiation I

TEST 3.1

1. (i) Write down the definition of the derivative of the function $f(x)$ at the point x.

(ii) Find the derivative of $f(x) = 3x + 4$ from first principles.

2. Differentiate the following functions with respect to x:

(i) $2x^3 + 3x - 4$

(ii) $\dfrac{3}{x^2}$

(iii) $(1 - x^2)^6$

(iv) $\sin(x^3 + 1)$

(v) $\dfrac{e^x}{x+1}$

(vi) $x^2 \ln x, \quad x > 1$

(vii) $\ln\left(x + \sqrt{x^2 - 1}\right), \quad x > 1$

(viii) $\tan^3(1 + x^2)$

3. An approximate solution of the equation $x^3 = 7$ is $x = 2$. Use the Newton-Raphson procedure to obtain the next two approximations.

4. Find $\dfrac{\partial f}{\partial x}$ and $\dfrac{\partial f}{\partial y}$ when

(i) $f(x, y) = x^4y^2 + x \sin y + x^2 + y^2 + 2$

(ii) $f(x, y) = \sin^2(x + y)$