

PERTH COLLEGE YR 12 3CD SPECIALIST MATHEMATICS **SEMESTER ONE 2010** TEST 2

Name: Time: 50 mins Total marks: /45 = %

Answer all questions neatly in the spaces provided.

- Show all working where appropriate.
- Calculator & Formula Sheet allowed
- 1) (3, 3 marks)

If
$$x = 3t^2 + 4t$$
 and $y = \frac{1}{t+1}$ find
a) $\frac{dy}{dx}$ in terms of t,

b)
$$\frac{d^2y}{dx^2}$$
 in terms of t

2) (2, 3, 3, 4, 6 marks)

Determine the following integrals. Show appropriate working for **full marks**.

a)
$$\int 3x^2 + \sin^{\pi} x \, dx$$

b)
$$\int \frac{5x^2 - 3x}{\sqrt{x}} dx$$

c)
$$\int 6x^2 \sqrt{(1+x^3)} dx$$

d)
$$\int \cos^2 x \sin^3 x \, dx$$

e) $\int \sin^4 x \, dx$

3) (5, 5 marks)

Perform the following integrations $\underline{\text{using the given substitutions}}$. Show all working.

a)
$$\int \frac{4x}{\sqrt{4-x^2}} \, dx$$

$$let x = 2 \sin \theta$$

b)
$$\int \frac{4x}{\sqrt{x-3}} \, dx$$

$$let u = x - 3$$

4) (4 marks)

The equation of the gradient to a curve is given by

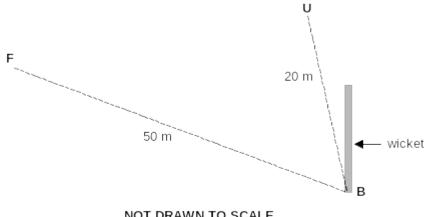
$$g'(x) = 4 + \frac{3}{x^2} + 2\pi \cos \pi x$$

 $g'(x) = 4 + \frac{3}{x^2} + 2\pi \cos \pi x$ If the point (1,2) lies on the curve, find the equation of g(x)

5) (7 marks)

In a cricket match, a ball is hit from B at a constant speed of $30~\text{ms}^{-1}$ towards a fieldsperson at F, located 50 metres from B along the bearing 290°. An umpire is standing at U, 20 metres from B along bearing 350°.

Determine how fast the distance between the ball and the umpire is changing when the ball has travelled half-way towards the fieldsperson. Assume that the fieldsperson and the umpire have not moved from their respective positions.



NOT DRAWN TO SCALE