

1. Obtain  $(\frac{1}{2}x - 3)^4$  3 marks

2. Find the co-efficient with the term  $x^2$

$$\left(4x^2 - \frac{7}{x^2}\right)^3$$
5 marks

3. (a) Express  $\frac{13 - x}{x^2 + 4x - 5}$  in partial fractions

(b) Hence find the integral and simplify the expression as far as possible for,

$$\int \frac{13 - x}{x^2 + 4x - 5} dx$$
5 marks

4. (a) Find the derivative of  $f(x) = \sin^2 x e^{\cos x}$  3 marks

(b) Hence evaluate  $f' \left(\frac{\pi}{2}\right)$  1 mark

5. Given  $f(x) = \ln(x) e^{\tan x}$ , find  $f'(x)$  and simplify 3 marks

6. Find  $\frac{dy}{dx}$  if  $y = \frac{3x^2 + 4}{7 - x}$ ,  $x \neq -1$  3 marks

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7. Using Gaussian elimination solve the following system of equations, 5 marks  
 expressing  $x$ ,  $y$  &  $z$  in terms of  $a$

$$x + y + 3z = 1$$

$$3x + ay + z = 1$$

$$x + y + z = -1$$

Explain what happens when  $a = 3$ ? 1 mark

8. Use the substitution, *Let*  $u = 3 + 2x$  to evaluate the integral 5 marks

$$\int_{\frac{1}{2}}^3 \frac{2x \, dx}{\sqrt{3 + 2x}}$$

9. Use the substitution to solve 5 marks

$$\int_0^1 \frac{12x \, dx}{1 + 3x^2}$$

10. Use the substitution,  $x = 1 - \cos \theta$  to evaluate 5 marks

$$\int_{\frac{\pi}{2}}^{\pi} \frac{\sin \theta \, d\theta}{(1 - \cos \theta)^3}$$

11. A solid is formed by rotating the curve  $y = e^{3x}$  between  $x = 0$  and  $x = 1$  through  $360^\circ$  about the  $x$ -axis.

Calculate the **volume** of the solid that is formed 5 marks

~ End ~