

Are you ready for Calculus?

Part A - Algebraic Manipulation: Simplify the expression

1. $\sqrt{x}(2x^2 + 3(x(2x + 1)))$

2. $\frac{\sqrt{x}}{\sqrt{x+3}}$

3. $\frac{9x^2-6x+4}{9x^2-1} \cdot \frac{3x^2+13x+4}{27x^3+8}$

4. $\frac{x+\frac{1}{y}}{y+\frac{1}{x}}$

Part B - Algebraic Equations: Solve

5. Solve for y : $4x^3 + 2x^2y + xy = 5y + x$

6. Solve for x : $\frac{x+1}{3x-1} + \frac{2x+1}{3x-2} = -1$

7. Solve for x : $x^4 - 13x^2 + 37 = 7$

8. Solve for x : $x^3 - 4x^2 + x + 6 = 0$

Part C - Functions and Graphs:

9. If $f(x) = \frac{x}{1-x}$, find $f\left(\frac{1}{x}\right)$

10. If $g(x) = x^2 - x - 1$, find $g(1-x)$

11. Sketch the graph of $y = x^2 - 2x$

12. Sketch the graph of $y = \frac{3x}{x-1}$

Part D – Exponents and Logarithms:

13. Solve for x : $\log_3(x-1) = 2$

14. Solve for x : $81^x \cdot 3^{x+1} = \frac{1}{9}$

15. Evaluate: $2\log_2 4 + \frac{1}{2}\log_2 5 - \frac{1}{2}\log_2 20$

16. Graph: $y = \ln(x-1) + 3$

Part E – Trigonometry:

17. If $0 \leq \theta \leq \frac{\pi}{2}$ and $\sin \theta = \frac{12}{13}$, find $\cos \theta$

18. Find $\sin\left(\frac{7\pi}{6}\right)$

19. $\tan\left(-\frac{5\pi}{3}\right)$

20. Solve: $\sin 2\theta - \cos \theta = 0$

21. Solve: $-2\cos^2 x + 2\sin^2 x = 2\cos x$

Part F – Multi-Step Question

Given the function f defined by $f(x) = 3x^3 - 2x^2 - 12x + 8$

- Find the zeros of f
- Sketch the graph
- Roughly label increasing and decreasing intervals on the graph
- Find the x coordinate of all points on the graph of f where the line tangent to the graph is parallel to the x -axis. Use the fact that the slope of f is defined as $9x^2 - 4x - 12$