



PRIFYSGOL CYMRU
Y Drindod Dewi Sant
UNIVERSITY OF WALES
Trinity Saint David
SWANSEA - ABERTAWE

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- Your answers must be legibly written **IN INK**. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.

Summary of Marks

Question Numbers Answered	1st Examiner	2nd Examiner (optional)	3rd Examiner (optional)
1	31		
3	34		
	65		
TOTAL			
RESULT			

1-a) i) $E = mgh$
 $\frac{E}{mh} = g$

Transpose
(g)
✓

1

ii) $T = 2\pi\sqrt{\frac{L}{g}}$

$2\pi T = \sqrt{\frac{L}{g}}$
2π

$(2\pi T)^2 = \frac{L}{g}$

$\frac{L}{(2\pi T)^2} = g$

1

iii) $v^2 = u^2 + 2gs$

$v^2 - u^2 = 2gs$

$\frac{v^2 - u^2}{2s} = g$

✓

2

b) i) $(pq)^0 = 1$
~~1~~

Simplify
✓

1

ii) $(\sqrt{q})^4 q^2$

✓

2

iii) $(p+q)(3p-q) + (2p+q)(p-q)$

$\{3p^2 - qp + 3qp + q^2\} + \{2p^2 - 2qp + qp - q^2\}$

$5p^2 + qp - 2q^2$

2

4

c) Show

$$\frac{2}{(x+1)} + \frac{3}{(x-4)} = \frac{5x-5}{(x+1)(x-4)}$$

Multiply $(x+1)(x-4)$ to each $\frac{2}{(x+1)}$ and $\frac{3}{(x-4)}$

$$\frac{2[(x+1)(x-4)]}{(x+1)(x+1)(x-4)} + \frac{3[(x+1)(x-4)]}{(x-4)(x+1)(x-4)}$$

$$\frac{2(x-4)}{(x+1)(x-4)} + \frac{3(x+1)}{(x+1)(x-4)}$$

$$2(x-4) + 3(x+1)$$

$$\frac{2x-8 + 3x+3}{(x+1)(x-4)}$$

$$\frac{2x-8 + 3x+3}{(x+1)(x-4)}$$

$$\frac{5x-5}{(x+1)(x-4)}$$

$$\frac{5x-5}{(x+1)(x-4)} = \frac{A}{(x+1)} + \frac{B}{(x-4)}$$

$$\frac{A(x+1)(x-4)}{(x+1)(x+1)(x-4)} + \frac{B(x-4)(x+1)}{(x+1)(x-4)(x-4)} = \frac{5x-5}{(x+1)(x-4)}$$

Bottom cancels

$$A(x-4) + B(x+1) = 5x-5$$

$$x = 4$$

$$A(4-4) + (B4+1) = (5 \times 4) - 5$$

$$0 + 5B = 20 - 5$$

$$5B = 15$$

$$B = 3$$

$$x = -1$$

$$A(-1-4) + B(-1+1) = (5 \times -1) - 5$$

$$-5A + 0 = -5 - 5$$

$$-5A = -10$$

$$A = 2$$

$$\therefore A = 2 \quad B = 3$$

d) logs

$$i) 2^{3x-5} = 4^{5x-6}$$

$$\log_2 2^{3x-5} = \log_2 4^{5x-6} \quad \text{law 3}$$

$$3x-5 \log_2 2 = 5x-6 \log_2 4$$

$$0.3010(3x-5) = 0.6021(5x-6)$$

$$0.9031x$$

$$0.9031x - 1.5051 = 3.0103x - 3.6124$$

$$2.1073 = 2.1072x$$

$$x = 1.0000$$

$$x = 1.00 \quad (\text{to 2 d.p.})$$

$$2^{3x-5} = 4^{5x-6} \quad \frac{5x-6}{3x-5} = \frac{5-6}{3-5} = -1$$

$$2^{-2} = 4^{-1}$$

$$0.25 = 0.25$$

$$ii) \ln(x^2-4) - \ln(x+8) = \ln x \quad \text{law 2}$$

$$\ln \frac{(x^2-4)}{(x+8)} = \ln x$$

$$\therefore \frac{(x^2-4)}{(x+8)} = x \quad x^2-4 = x(x+8)$$

$$x^2-4 = x^2+8x \quad \therefore -4 = 8x$$

$$x = -0.5$$

$$\begin{array}{rcl} 3. \text{ a) } & 7x + 4y = 46 & \times 6 \\ & 8x + 6y = 57 & \times 4 \end{array}$$

$$42x + 24y = 276$$

$$32x + 24y = 228$$

$$10x = 48$$

$$x = 4.8 \text{ (to 1 d.p.)}$$

$$(7 \times 4.8) + 4y = 46$$

$$33.6 + 4y = 46$$

$$4y = 12.4$$

$$y = 3.1 \text{ (to 1 d.p.)}$$

To 1 significant figure: $x = 5$ $y = 3$

$$\text{b) } 3x^2 + 5x - 2 = 0 \quad (\text{solve to 2 d.p.})$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 3 \quad b = 5 \quad c = -2$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(3)(-2)}}{2(3)} = \frac{-5 \pm \sqrt{25 + 24}}{6}$$

$$x = \frac{-5 \pm \sqrt{49}}{6} = \frac{-5 \pm 7}{6} = \frac{12}{6} \text{ and } \frac{-2}{6}$$

$$x = 2 \text{ and } -\frac{1}{3} \text{ or } x = 2 \text{ and } 0.67 \text{ (to 2 d.p.)}$$

c) Solve by factorising

i) $x^2 + 11x + 30 = 0$

$$(x+5)(x+6) = 0$$

~~$$x+5 = -x-6$$~~

~~$$2x = -11$$~~

~~$$x = -\frac{11}{2}$$~~

~~$$x = -5.5$$~~

~~$$x = -5$$~~

$$x = -5 \text{ and } -6$$

$$\begin{array}{ll} 1 \times 1 & 1 \times 30 \\ 11 \times 1 & 2 \times 15 \\ & 3 \times 10 \\ & 4 \times 5 \times 6 \end{array}$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{-11 \pm \sqrt{121 - 120}}{2}$$

3

ii) $x^2 - 11x = 0$

$$(x-11)(x+0) = 0$$

$$x^2 + 0 - 11x + 0$$

$$x = 0 \text{ and } 11$$

$$\begin{array}{l} 0 + 11 \\ 1 + 10 \\ 2 + 9 \\ 3 + 8 \\ 4 + 7 \\ 5 + 6 \end{array}$$

3

iii) $x^2 - 4 = 0$

$$(x+2)(x-2) = 0$$

$$x^2 - 2x + 2x - 4 = 0$$

$$x = 2 \text{ and } -2$$

3

Question No.

d) ~~derive~~ 1st derivatives (no rules)

$$i) \quad y = 6x^2(x^3 - 2x^2 + 5x - 1)$$

$$y = 6x^5 - 12x^4 + 30x^3 - 6x^2$$

$$\frac{dy}{dx} = 30x^4 - 48x^3 + 90x^2 - 12x$$

2

$$ii) \quad y = \frac{7}{x^2} - \frac{4}{x} + 8$$

$$y = 7x^{-2} - 4x^{-1} + 8$$

$$\frac{dy}{dx} = -14x^{-3} + 4x^{-2}$$

4

$$iii) \quad y = \frac{\sin x}{\cos x} \quad \frac{\sin x}{\cos x} = \tan x$$

$$\therefore y = \tan x$$

$$\frac{dy}{dx} = \sec^2 x$$

2

e) Function of a function (Chain rule)

i) $y = (2x^2 - 5x + 1)^7$

$u = (2x^2 - 5x + 1) = u$

$\frac{dy}{dx} = 7(2x^2 - 5x + 1)^6 (4x - 5)$

$y = u^7 \quad \frac{dy}{du} = 7u^6$

$\frac{dy}{dx} = (28x - 35)(2x^2 - 5x + 1)^6$

✓ 2

ii) e^{x^2+4}

~~$2x(x^2+4)e^{x^2+4}$~~

$u = e^x \quad \frac{dy}{du} = 1e^x \therefore \frac{dy}{dx} = 1$

$\frac{dy}{dx} = (x^2 + 4e^{x^2+4}) (1)$

$\frac{dy}{dx} = x^2 + 4e^{x^2+4}$

✗

iii) $\cos^3 2x$

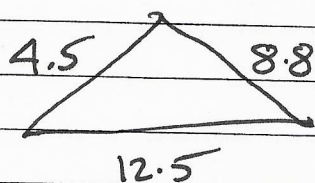
$u = (\cos 2x)^3$

$\frac{dy}{du} = 3(\cos 2x)^2$

$\frac{dy}{dx} = (-2 \sin 2x) \cdot 3(\cos 2x)^2$

✓ 2

f)



Find area

$\sqrt{s(s-a)(s-b)(s-c)} \quad s = \frac{a+b+c}{2}$

$s = \frac{25.8}{2} = 12.9$

✓

4

$\sqrt{12.9(12.9-4.5)(12.9-8.8)(12.9-12.5)}$

$\sqrt{12.9(8.4)(4.1)(0.4)}$

$= \sqrt{112.86} = 10.6236$

area = 10.62 cm² (to 2 d.p.)

✗

