

Answers

Sheet 1

P1 a) $31/24$ b) $-2/3$ c) $173/140$ d) $3/2$ e) $5/6$ f) $-9/7$ g) $49/9$ h) $3/2$

P2 a) 4 b) 9 c) 2 d) $1/3$ e) 16 f) 108 g) 256

P3 a) 10^3 b) 10^{20} c) x^{11} d) $C^{10}D^{10}$ e) a^3 f) a^{-4} g) $10x^{17}y^8$ h) $2y^{10/3}$
i) y^6 j) z^{4a} k) x^{-6} l) 10^{-8} m) y^2 n) B^2 o) C p) $4x^{-1}y^{1/24}$

P4 a) 10Ω b) $12/5\Omega$ **P5** a) $0 < x < 1$ b) $x > 1$ **P6** ms^{-2}

Sheet 2

P1 a) 1.25×10^{-3} b) 2.07×10^4 c) 5×10^{-6} d) 2.5×10^{-4} e) 6×10^{-5}
f) 8×10^2 g) 5×10^{-3} h) 3.1×10^{12} i) -6.06×10^{-12}

P2 a) $1 \times 10^{-5} \text{ m}$ b) $3.3 \times 10^{-6} \text{ A}$ c) $2.2 \times 10^4 \text{ ms}^{-1}$ d) $1.44 \times 10^{-16} \text{ m}^2$ e) $7 \times 10^{20} \text{ Wm}^{-2}$

P3 $2.45 \times 10^{-5} \text{ m}$ **P4** 0.36 W **P5** (i) $1.2 \times 10^4 \text{ N}$ (ii) $1.2 \times 10^5 \text{ N}$ (iii) $2 \times 10^{-14} \text{ ms}^{-2}$

P6 (i) $2.4 \times 10^{-6} \text{ J}$ (ii) $1.5 \times 10^{-7} \text{ J}$

Sheet 3

P1 a) $12 + 4a$ b) $7x - xy$ c) $x^4y + x^3y^2$ d) $6 + 3a - 2b - ab$ e) $z^2 + 2zx + x^2$
f) $a^2 - a - 6$ g) $-12a^2 - 2b^2 + 10ab$

P2 a) $5y/2$ b) $(z^2 + 5zx)/2$ c) 2 d) $z - 1$ e) $x - y$ **P3** a) 10^{-19} kg b) 4×10^{25}

P4 10^{-26} kg **P5** (a)(i) 10.5 ms^{-1} (a)(ii) 1260 m (b)(i) 5.5 ms^{-1} (b)(ii) 660 m **P6** 4 s

Sheet 4

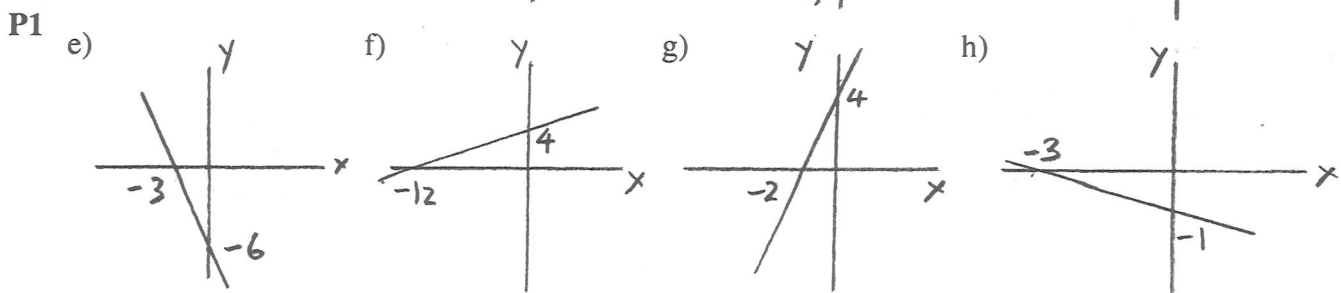
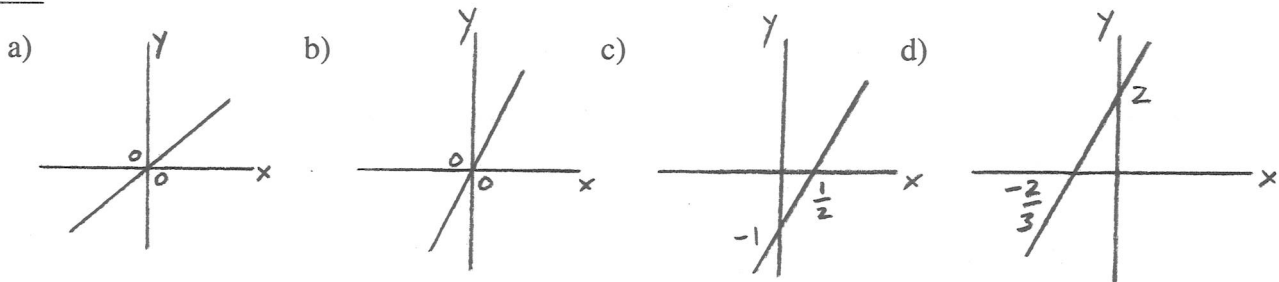
P1 a) $x = -3$ b) $y = 9$ c) $p = 5/2$ d) $b = 1$ e) $x = 16$ f) $x = 9/2$ g) $a = 1$ h) $a = -9/4$

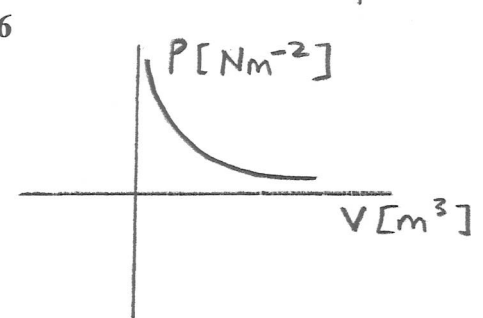
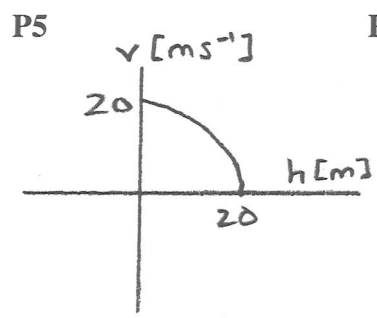
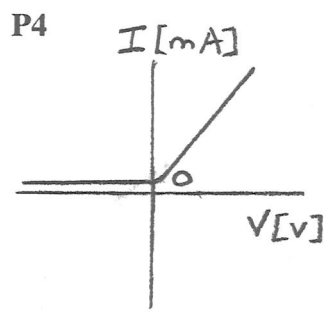
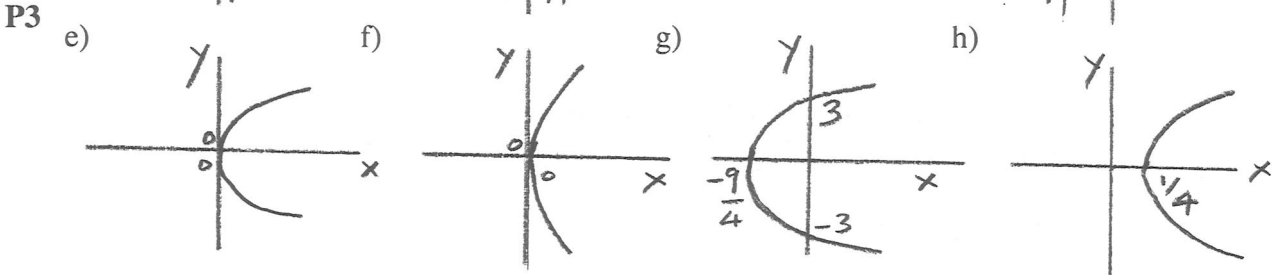
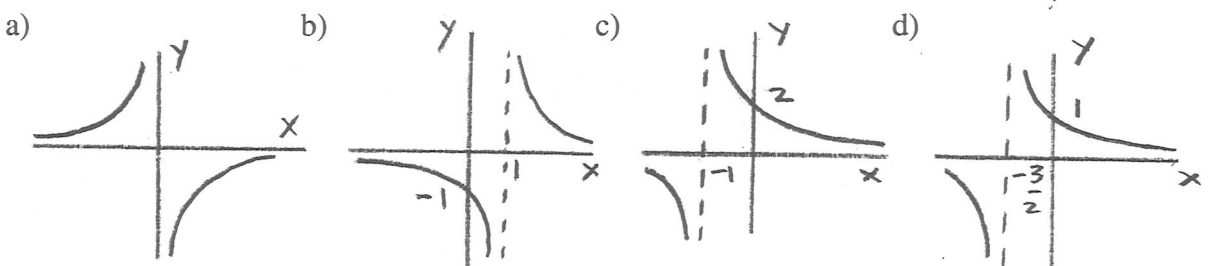
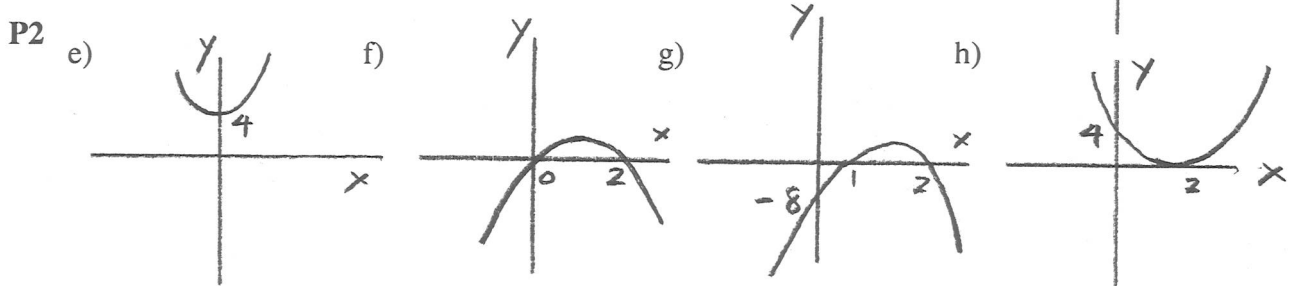
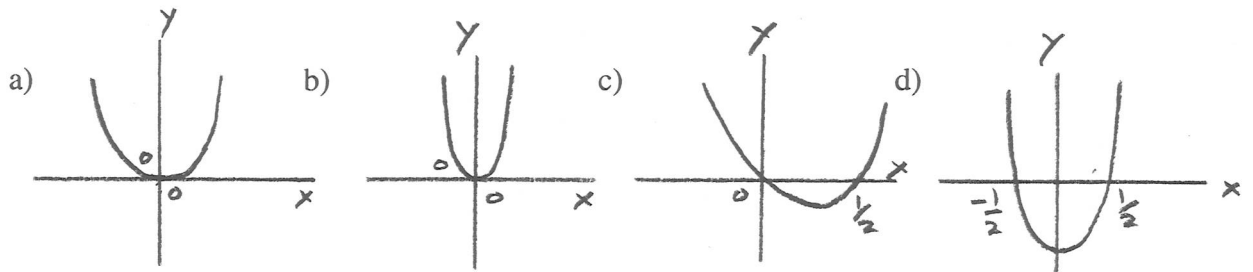
P2 a) $x = \pm 3$ b) $x = \pm 81$ c) $y = 2, -8$ d) $a = 3$ e) $x = 1, 5$ f) $x = 0$ g) $x = -4, -1/3$ h) $y = 3$

P3 a) $y = -1, x = 4$ b) $p = 1, q = -2$ c) $y = 1, x = -3/2$ d) $y = 5, x = 20/3$

P4 a) $6.4 \times 10^{-14} \text{ N}$ b) $3.2 \times 10^{-19} \text{ C}$ **P5** 10 min. **P6** $R_A = R_B = 10^3 \Omega$

Sheet 5



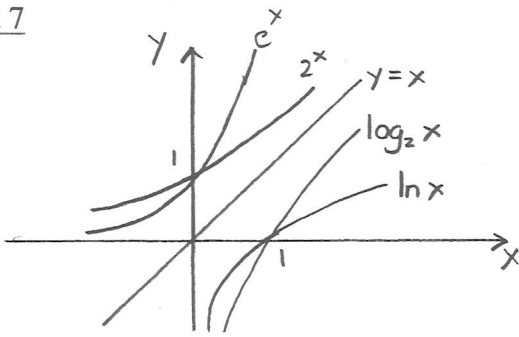


Sheet 6

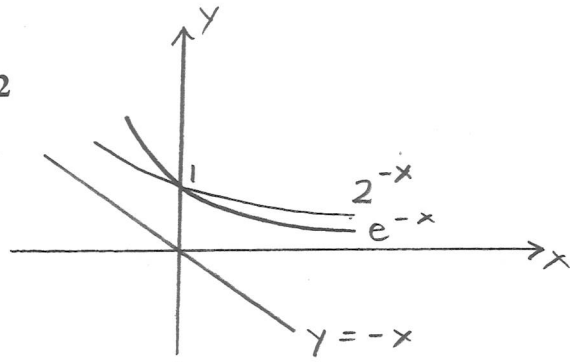
- P1 a) L b) T c) T^{-1} d) ML^2T^{-2} e) $ML^{-1}T^{-2}$ f) $ML^2T^{-2}\Theta^{-1}$ g) $L^2T^{-2}\Theta^{-1}$ h) $ML^2T^{-2}N^{-1}\Theta^{-1}$
P2 a) L^2 b) L^4 c) M d) L^4T e) $L^{8/3}T^{-2/3}$ f) $M^3T^{-1}L^{-12}$ g) LT^{-1} h) L^6
P3 c) d) P4 a) $4ms^{-1}$ b) $2ms^{-1}$ c) 2 kg s d) 8.7 kg m e) $1.03kg^3$
P5 $x=0, y=1/2, z=-1/2$ P6 $5 \times 10^{14}\text{ Hz}$

Sheet 7

P1



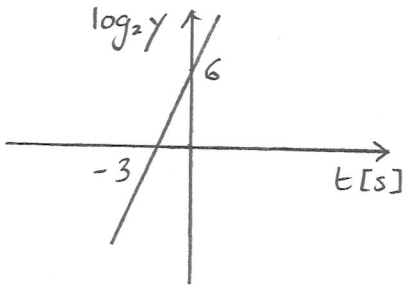
P2



P3 a) 1 b) 2 c) 0 d) -1 e) -2 f) 1/2

P4 a) $1 + \log_3 x$ b) $3 + 2\log_3 x$ c) $2\ln x - 2\ln y$ d) $\ln x + x$ e) $\log(2x + 3y)$

P5

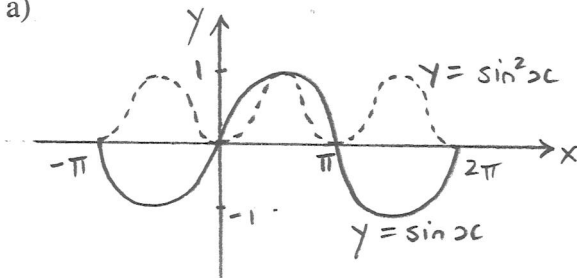


P6 $(\ln 2)/2$ days

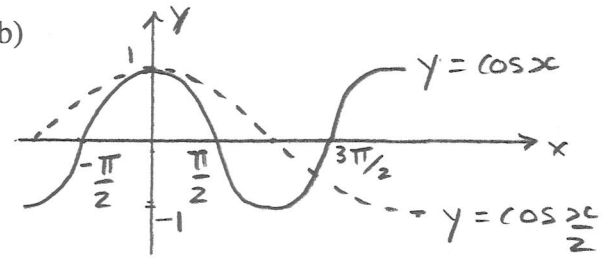
Sheet 8

P1 a) 0 b) $1/\sqrt{3}$ c) 1 d) $\sqrt{3}$ e) ∞ f) $-\infty$

P2 a)



b)

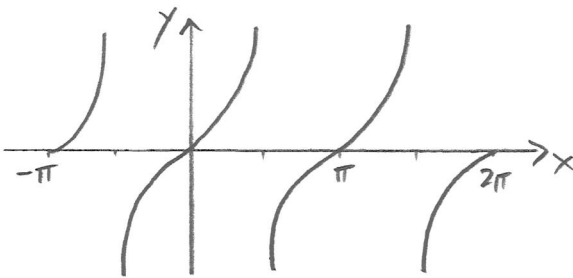


a) $\cos x \cos y + \sin x \sin y$

P3 b) $2 \sin x \cos x$

c) $\cos^2 x \cos y - \sin^2 x \cos y - 2 \sin x \cos x \sin y$

c)



P4 a) -1 b) 0 c) $(\sqrt{3} - 1)/2\sqrt{2}$ d) $(\sqrt{3} - 1)/2\sqrt{2}$ e) $1/\sqrt{2}$ P5 7 km P6 $30^\circ, 30^\circ, 40^\circ$

Sheet 9

P1 a) 3 b) $16t^3$ c) $-2\pi/t$ d) $3t^2 + 4t^3$ e) $-3At^2/(At^3 + B)^2$ f) $4A(A\sqrt{t} + B)^2/2\sqrt{t}$

P2 a) $2\cos z$ b) $-2\sin z \cos z$ c) ae^{az} d) $ABe^{Bz} \cos(e^{Bz})$ e) $3z^2 \sec^2 z^3$ f) $2 + \ln z^2$

P3 a) $1/4$ b) -1 c) 1 d) ∞ e) $1/2\sqrt{e}$ f) $1/2\sqrt{n}$

P4 a) i) $2At + B$ ii) $2A$ b) i) 75m, 40ms^{-1} , 10ms^{-2} ii) 3375m, 260ms^{-1} , 10ms^{-2}

P5 $2.7 \times \pi^{-1/2} \times 10^4 \text{m}^3$ P6 $5/8$

Sheet 10

P1 a) $3t^2/2 + c$ b) $4t^5/5 + c$ c) $-\pi/t + c$ d) $t^4/4 + t^5/5 + c$ e) $e^{2t+3}/2 + c$ f) $(\sin 4t)/4 + c$

P2 a) $56/3$ b) $1/2$ c) 1 d) $(e^4 - 1)/2$ e) $(\ln 7)/2$ f) 1

P3 a) $\ln(1+x^2)^{1/2} + c$ b) $\ln[(1+x)/(1-x)]^{1/2} + c$ c) $-(2x^2 - 3)^{-3}/4 + c$
d) $2\sqrt{2x^3 + 9} + c$ e) $-(1-x^2)^{3/2}/3 + c$ f) $4\ln[(x+2)/(x+3)] + c$

P4 a) $4\sin^3 2t$ b) $0.5m$ **P5** 5 years **P6** $1/6\text{km}^2$