Mathematics - Course 221

APPENDIX 4: ANSWERS TO ASSIGNMENTS AND REVIEW EXERCISES

421.10-4 Assignment

1. (a) 10^{7} (b) 10 (c) 10^{6} (d) 10^{12}
   (e) 10^{-8} (f) 10^{-9} (g) 10^{-4} (h) 10^{-4}

2. (a) 10^{-2} (b) 10^{-8} (c) 10^{2} (d) 1
   (e) -10^{-7} (f) 10^{13} (g) 10^{10} (h) 10^{-13}
   (i) 10^{9} (j) 10^{-11} (k) 10^{13} (l) -10

3. (a) 100 (b) 0.001 (c) 100,000 (d) 0.000001
   (e) 1,000,000 (f) 0.0001

4. (a) 1.65×10^{5} (b) 6.93×10^{-3} (c) 3.75×10
   (d) 2.5×10^{-2} (e) 2.934×10^{3} (f) 1.01×10^{-3}
   (g) 1×10^{4} (h) 2.0×10^{-4} (i) -2.49×10^{2}
   (j) 9.7×10^{-1} (k) 1.76×10^{-1} (l) 2.7
   (m) 9.57×10^{4} (n) 1.75×10^{-14} (o) 2.4×10^{7}
   (p) 3.2×10^{12}

5. (a) 2.4×10^{3} (b) 5.6×10^{12} (c) -1.1×10^{14}
   (d) -4.3×10^{3} (e) 4.5×10^{12}

6. (a) 9.3×10^{5} (b) 6.9×10^{5} (c) 3.4×10^{7}
   (d) 5.5×10^{-12} (e) 5.5×10^{2}

7. (a) 2.3×10^{-1} (b) 9.4×10^{-5}

421.20-1 Assignment

1. (a) $-10\frac{5}{6}$ (b) 9 (c) 5

2. (a) a^{10} (b) $\frac{3}{32}\,a^{10}$ (c) b^{12} (c) 3^7

   (e) m^6 (f) a^{19} (g) $\frac{1}{a}$ (h) b^7

   (i) a^{14} (j) $-27a^6$ (k) $\frac{1}{32}\,x^{20}$ (l) $a^{5/6}$

   (m) $a^{1/6}$ (n) $9x^2y$ (o) 1 (p) $x\ y^{-4}$

3. (a) 27 (b) $\frac{1}{32}$ (c) $\frac{1}{2}$ (d) $6\frac{3}{4}$

   (e) $-\frac{1}{27}$ (f) 6 (g) -2 (h) -32

   (i) $1\frac{7}{9}$

4. (a) 1 (b) $4x^8$ (c) $3^5a^2b^3$ (d) $\frac{18y^2z^2}{x^3}$

5. 9.1×10^{-28}g

6. 6.2×10^{18} fissions/s

7. (a) 11a (b) $6x^2 + 6x + 5xy + 5$

   (c) $25x + 20y$ (d) $8a + 5b + 12c$

   (e) $5k - 2j$ (f) 10a

   (g) $4xy^2 + y$ (h) $4x^2y^3 + 1 - x$

   (i) $-5x - y + 4z$

8. (a) $-2y$ (b) $\frac{1}{3y}$ (c) 5b (d) -2

   (e) x (f) -3abc (g) $\frac{2y}{x}$ (h) $\frac{1}{2}\,x^2$

   (i) $-24x^2y^4p$ (j) $22p^2qs^2t$

9. (a) $x^2 - 4xy - 32\ y^2$ (b) $15x^2 + 22x + 8$

(c) $12a^2 - 23ac + 10c^2$ (d) $x^4 - y^2$

(e) 0 (f) $2x + 5y$

(g) $a^2 - 1$ (h) $4x + 5$

(i) $3x - 8$ (j) $-(x^2 + x - 3)$

10. (a) $32m^2nx$ (b) $-36ab^2c^2d$

(c) $-18my + 15ty$ (d) $20h - 30k$

(e) $2x - 23y$ (f) $x^2 + xy$

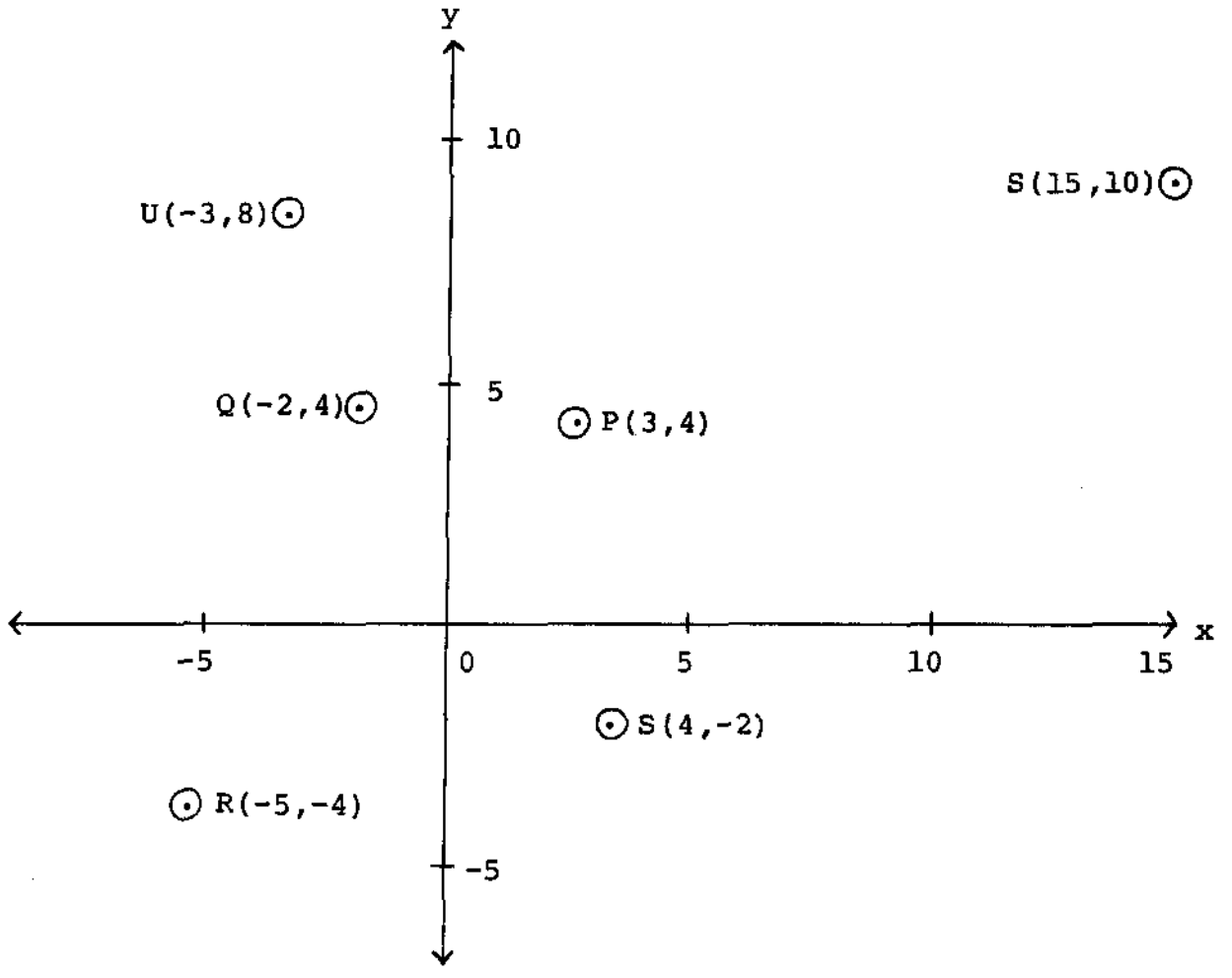
(g) $3c + k$ (h) $-b + 7c$

(i) $-3a - 6x$ (j) $2ab$

(k) $2xy$

421.40-1 Assignment

1.



3. (a) 12 A (b) 2.4 Ω

4. (a) 893 kPa (b) 12.5 cm

421.40-2 Assignment

1. (a) $C(r) = 2\pi r$

   (b) $d(t,v) = vt$

   (c) $A(r,h) = 2\pi r^2 + 2\pi rh$

2. $f(6) = 9$; $f(0) = -3$; $f(-2) = -7$

3. $H(0) = 9$; $H(1) = 0$; $H(a) = 0$

4. $d(p) = \frac{\sqrt{2p}}{4}$

5. (a) ± 2

   (b) no real roots since curve does not cross x-axis

   (c) $-2.9, -0.2, 3.1$

   (d) $3, -2$

   (e) $-1.53, -0.33, 1.87$

321.10-3 Assignment

1. (a) (i) $R = 1.67\Omega$ (ii) $I = 1.2$ A.

   (b) (i) $R = 2.17\Omega$ (ii) $I = 4.6 \times 10^{-2}$ A.

2. (a) $7.4 \times 10^{-5}\ s^{-1}$ (b) 2.6 h

3. (a) $\frac{1}{2}$ (b) 0.6 (c) 9 (d) 4

   (e) -0.2 (f) -10 (g) 10 (h) 8

4. 0.84 kΩ

5. 1.1×10^{2} hr.

6. (a) -3.1 (b) -9.8 (c) 2.6 (d) 1.7×10^{3}

   (e) 1.1 (f) -11 (g) $x = 3^{2.7} = 19$

   (h) $x = 7^{4.8} = 1.1 \times 10^{4}$ (i) $x = 9^{2.1} = 1.0 \times 10^{2}$

   (j) $x = 4^{5.3} = 1.6 \times 10^{3}$ (k) $x = 17^{16.8} = 4.7 \times 10^{20}$

   (l) $x = 6^{7.5} = 6.9 \times 10^{5}$

7. (a) $\frac{3}{4} \log X + \frac{1}{6} \log Y + \frac{5}{4} \log Z$

   (b) $\log X + \frac{15}{2} \log Z - 9 \log Y$

   (c) $\frac{7}{6} \log X - \frac{5}{12} \log Y + \frac{1}{2} \log Z$

321.10-3 Assignment

8. (a) 1339.43 (b) 3.02×10^{-2} (c) 25.31
   (d) 50.12 (e) 5.01×10^{-5} (f) 0.76

9. (a) 9.1×10^{2} (b) 0.46 (c) 1.2 (d) 3.2×10^{3}

321.10-4 Assignment

4. 3.3 minutes

5. 1.55×10^{3} MPC

6. 19.5 s

221.10-1 Assignment

1. 3×10^{-3}

2. 2×10^{-4}

3. (a) 1.4×10^{-3} (b) 1.4×10^{-3}

4. 1.7×10^{-2}

5. 4×10^{-4}

6. 3×10^{-3}

7. every 4 weeks

221.20-1 Assignment

1.

	Slope	Angle of Inclination	Equation
(a)	$\frac{4}{3}$	53.1°	$4x - 3y = 0$
(b)	$\frac{-2}{3}$	146.3°	$2x + 3y - 6 = 0$
(c)	-1	135°	$x + y = 0$
(d)	0	0°	$y - 2 = 0$
(e)	∞	90°	$x + 3 = 0$

2. Slope PQ = slope QR = ½; Q is common to segments PQ, QR
∴ P,Q, R are collinear.

3.

	Slope	x - intercept	y - intercept
(a)	-1	4	4
(b)	$\frac{5}{4}$	4	-5
(c)	0	none	$\frac{6}{5}$
(d)	undefined	$\frac{-4}{15}$	none

221.20-2 Assignment

1.

	Tangent slope at (x,f(x))	Tangent slope at x = 2
(a)	$10x - 2$	18
(b)	$-\frac{2}{x^2}$	$-\frac{1}{2}$

2. (a) $8x^3 - 12x^2$ (b) $\frac{2x}{a^2} - \frac{2a^2}{x^3}$

(c) $-\frac{3}{2}x^{-3/2}$ or $-\frac{3}{2\sqrt{x^3}}$

3. (a) $2x - 6$ (b) $10x^4 - 3x^2$

(c) $2ax + b$ (c) $\frac{2}{3}x^{-1/3} - x^{-2/3}$

4. (a) 11 (b) -3

(c) $-\frac{1}{3}$ and 1

221.20-3 Assignment

1. (a) -4 (b) -2 (c) $\frac{1}{2}$

2. $(-1,-3)$

3.

	Tangent Equation	Normal Equation
(a)	$x + y - 2 = 0$	$x - y = 0$
(b)	$y = 4$	$x = 1$

4.

	$v(t)$	$v(2)$	$a(t)$	$a(2)$
(a)	$16t - 3$	29	16	16
(b)	$-8t - 4t^3$	-48	$-8 - 12t^2$	-56
(c)	$20t - 80/t^2$	20	$20 + 160/t^3$	40

5. 25m

6. Roots of $f'(x) = 0$ are $x = 2.73, -0.73$; $y = f(x)$ has a local maximum at $x = -0.73$, and a local minimum at $x = 2.73$.

221.20-4 Assignment

1. (a) $2x\, e^{x^2-4}$ (b) e^{-x}

   (c) $-x^{-2}e^{-x^{-1}}$ (d) $x^{-3/2}e^{-x^{-1/2}}$ or $x^{-3/2}e^{-1/\sqrt{x}}$

   (e) $\frac{5}{2}(5t^{3/2} - t^{-1/2})e^{t^{5/2} - t^{1/2}}$

   (f) $x^{-4}e^{-1/x^3}$

2. (a) (i) $v(t) = e^t - 3t^2$ (ii) $a(t) = e^t - 6t$

   (iii) $v(2) = e^2 - 12$

   (b) (i) $v(t) = -e^{-t} + 2$ (ii) $a(t) = e^{-t}$

   (iii) $v(2) = 2 - e^{-2}$

3.

t	0	0.25	0.5	1	1.5	2.0	2.5	2.75	3
s	1	1.27	1.52	1.72	1.10	-0.61	-3.44	-5.15	-6.91
v	1	1.10	0.90	-0.28	-2.27	-4.61	-6.57	-7.04	-6.91
a	1	-0.22	-1.35	-3.28	-4.52	-4.61	-2.82	-0.86	2.09

4. $9.3 \times 10^{-12}\ s^{-1}$

5. (a) 0.45 Ci
   (b) (i) 5.2×10^{13} (ii) 1.1×10^{12}
   (c) (i) 0.34 Ci (ii) 7.1 mCi
   (d) 48 minutes
   (e) 4.4 hours

6. see text

7. By definition of $t_{\frac{1}{2}}$, $0.5A_0 = A_0 e^{-\lambda t_{\frac{1}{2}}}$

$$\therefore \quad \ln 0.5 = -\lambda t_{\frac{1}{2}}$$

$$\therefore \quad t_{\frac{1}{2}} = -\frac{\ln 0.5}{-\lambda}$$

But $\ln 0.5 = \ln \frac{1}{2} = \ln 2^{-1} = -\ln 2$

$$\therefore \quad t_{\frac{1}{2}} = \frac{\ln 2}{\lambda}$$

9.

t	0	1	2	3
N(t)	10^{20}	7.94×10^{19}	6.31×10^{19}	5.01×10^{19}

t	5	10	15	18
N(t)	3.16×10^{19}	9.99×10^{18}	3.16×10^{18}	1.58×10^{18}

10.

t(s)	P(W)	P(%F.P.)	P^1(%F.P./s)
0	100	1×10^{-4}	5×10^{-6}
20	2.7×10^{2}	2.7×10^{-4}	1.4×10^{-5}
40	7.4×10^{2}	7.4×10^{-4}	3.7×10^{-5}
60	2.0×10^{3}	2.0×10^{-3}	1.0×10^{-4}
80	5.5×10^{3}	5.5×10^{-3}	2.7×10^{-4}
100	1.5×10^{4}	1.5×10^{-2}	7.4×10^{-4}
120	4.0×10^{4}	4.0×10^{-2}	2.0×10^{-3}
140	1.1×10^{5}	1.1×10^{-1}	5.5×10^{-3}
160	3.0×10^{5}	3.0×10^{-1}	1.5×10^{-2}
180	8.1×10^{5}	8.1×10^{-1}	4.1×10^{-2}
200	2.2×10^{6}	2.2	0.11
220	6.0×10^{6}	6.0	0.30
240	1.6×10^{7}	16	0.81
260	4.4×10^{7}	44	2.2
280	1.2×10^{8}	1.2×10^{2}	6.0
300	3.3×10^{8}	3.3×10^{2}	16.3

(c) The rate at which the needle moves across the linear scale (linear rate) increases exponentially with time--the needle moves imperceptibly for about 3 minutes, then moves ever more rapidly across the scale, covering the final half of the range in just 14 seconds. This is just as one would expect from the mathematical expression

$$P'(t) = \frac{\Delta k}{L} P(t) = \frac{\Delta k}{L} P_0 e^{\frac{\Delta k}{L} t}$$

The rate at which the needle moves across the log scale (rate log P) is constant, ie, the needle advances by the same amount each 20 seconds. This is in agreement with the mathematical expression

$$\frac{d}{dt} \log P(t) = \frac{\Delta k}{L} \log e \quad \text{(cf. question 12)}$$

(d) linear scale more sensitive at high power; log scale at low power

(e) (i) signal output proportional to log P is more sensitive to changes in P at low power ($\lesssim$10% full power, say)

(ii) signal output proportional to P is more sensitive to changes in P at high power

11. see text

221.20-5 Assignment

1. Force F equals mass m times R/C velocity v wrt time t.

   Angular velocity ω equals R/C angular displacement θ wrt time t.

   Angular acceleration α equals R/C angular veloctiy ω wrt time t.

   Torque τ equals moment of intertia I times R/C angular velocity ω wrt time t.

   Force F equals rate of decrease of potential energy E_p wrt distance r from force center.

   Power P equals time rate of energy output (or conversion).

   Electric current i equals rate of flow of charge q.

   Capacitor current i_c equals capacitance C times R/C capacitor voltage V_c wrt time t.

   Inductor voltage V_L equals inductance L times R/C inductor current i_L wrt time t.

   Rate of decrease of number N of radioactive nuclei remaining at time t equals decay constant λ times N.

   Rate of decrease in radioactive source activity A equals decay constant λ times A.

   Rate of decrease in number N of nuclear projectiles equals macroscopic cross section Σ times penetration depth x.

   'Linear rate' power P equals reactivity Δk times power P divided by mean neutron lifetime L.

   'Rate log power' equals reactivity Δk divided by mean neutron lifetime L.

   Specific heat capacity C of a substance equals R/C quantity Q of heat stored in substance wrt temperature T of substance, divided by the mass m of the substance.

   Heat Q flow rate (in a fluid) equals specific heat capacity C times temperature difference ΔT across system times mass m flow rate.

Heat H flow rate equals minus thermal conductivity k times cross sectional area A times R/C (rate of increase) temperature T wrt depth x in conducting medium. (Minus sign indicates directions of heat flow and increasing temperature are opposite.)

R/C of gas volume V wrt temperature T equals number n of moles of gas times gas constant R divided by gas pressure P.

Voltage V induced across a coil equals number N of turns in coil times rate of decrease in magnetic flux Φ linking the coils.

2. See Table 1, lesson 221.20-5.

3. $6.0 \times 10^{-3} N$

4. (a) $V_2 = -M\frac{di_1}{dt}$

   (b) (i) $V_2(t) = 6t^2 - 12t$ (ii) $V_2(2) = 0$

221.30-1 Assignment

1. see text

2. see text

3. (a) $-\frac{3}{2}x^2 + C$ (b) $e^t + \frac{1}{4}t^4 + C$

   (c) $\frac{2}{3}x^3 + \frac{3}{2}x^2 - 5x + C$ (d) $2e^{\sqrt{x}} + C$

   (e) $x^4 - \frac{3}{4}x^{4/3} + C$ (f) $-e^{-t^2} + \frac{2}{5}t^{5/2} + C$

4.

	v(t)	s(t)
(a)	0	0
(b)	$2t + 10$	$t^2 + 10t + 14$
(c)	$t^2 + v_0$	$\frac{1}{3}t^3 + v_0 t$
(d)	$11 - e^{-t}$	$e^{-t} + 11t - 11$

5. $s(t) = v_0 t - 4.9t^2$

6. (a) 99 (b) $37\frac{1}{3}$

   (c) $72\frac{1}{3}$ (d) $\frac{1}{2}(1 - e^{-4})$

7. (a) $79\frac{7}{15}$ (b) 77.5

   (c) $23 - e^2$

221.30-2 Assignment

1. (a) 8 square units (b) $21\frac{1}{3}$ square units

   (c) 9 square units

2. (b) (i) 7.2×10^2 mrem (ii) 1.8×10^2 mrem/h

3. (a) $\frac{V_0^2 C}{2T}(1 - e^{-2T/RC})$ (b) 1 W

4. (a) $v(t) = -6 - 9.8t$; $s(t) = 1000 - 6t - 4.9t^2$

   (b) 14 seconds

   (c) -73 m/s

   (d) 6.5×10^2 m

5. 12 J

6. (a) 1.6×10^6 N (b) 9.8×10^4 Pa

   (c) at (0,11)

221.40-1 Review Exercises

Review Exercise #1

1. 4×10^{-3} 2. 8×10^{-4}

3. (a) 2×10^{-3} (b) 3×10^{-6}

4. (a) 3.7×10^{-3} (b) test daily

   (c) test every 12 weeks

5. 0.08

6. (a) 3×10^{-3} (b) 2×10^{-5}

Review Exercise #2

1. (a) $3x + y - 10 = 0$ (b) $4x + 3y + 1 = 0$

   (c) $2x - 5y - 25 = 0$ (d) $2x - 5y - 13 = 0$

   (e) $3x - 5y - 28 = 0$ (f) $x + y + 8 = 0$

2. (a) 5 (b) 40

   (c) $x^2 + 2ax - 2x + a^2 - 2a + 5$

3. no real roots

4. (a) slope $= \frac{6}{5}$; y-intercept $= \frac{8}{5}$

   (b) slope $= -\frac{1}{10}$; y-intercept $= \frac{3}{4}$

5. (a) (i) $\frac{5}{3}$ (ii) -20

   (b) (i) 6 (ii) $-\frac{1}{2}$

   (c) (i) $-\frac{3}{5}$ (ii) $\frac{1}{20}$

Review Exercise #3

1. (b) 4 m/s (c) $2t + 2$ m/s (d) 6 m/s

2. (a) $v(t) = -1/\sqrt{t}$; $v(4) = -\frac{1}{4}$; $a(t) = \frac{1}{2}t^{-3/2}$

   (b) $v(t) = 3t^2 - 4$; $v(5) = 71$; $a(t) = 6t$

3. (a) $15x^2 - 2$ (b) $\frac{8}{3\sqrt[3]{x}}$

   (c) $-2x - 4x^{-3}$ (d) $\frac{3x - 1}{2\sqrt{x}}$

4. (a) tangent $4x + y - 2 = 0$

   normal $x - 4y + 25 = 0$

   (b) tangent $y = 2$

   normal $x = 1$

5. (a) 3.0 Ci (b) 1.1×10^{13}

6. (a) 4.2 Ci (b) 16 h (c) 53 h (d) 3.1×10^{16}

Review Exercise #4

1. $(-5, 58\frac{1}{3})$ and $(3,-11)$

2. $t = -\frac{5}{2}$ and $t = \frac{2}{3}$

3. (a) $x = 1$ and $x = -\frac{1}{3}$

   (b) $x = -\frac{5}{2}$ and $\frac{3}{5}$

4. $t = \frac{3}{2}$ and $t = -1$

Review Exercise #5

2. (a) 2.5 (b) -4 (c) $4/t$ (d) $-\lambda t$

4. (a) 5.1 h (b) 3 (c) 34 h (d) 72 h
   (e) 1.9×10^{15}

5. (a) $P = 4.8 \times 10^{17}$ W ; $P^1 = 1.5 \times 10^{16}$ W/S
   (b) 9.6 minutes

7. (a) $-3/\sqrt{x}^3$ (b) $6x^2 - 22x$
   (c) $-\frac{1}{2\sqrt{x}} - \frac{2}{x^2}$ (d) $4xe^{2x^2}$
   (e) $-400\ e^{-4t}$ (f) $-\frac{2}{t^2}\ e^{2/t}$

Review Exercise #6

1. (a) $15x^4$ (b) $x^{-3/2}$
   (c) $\frac{5}{3}\ x^{2/3} - \frac{2}{3}\ x^{-1/3}$ (d) $\frac{e^{\sqrt{x}}}{2\sqrt{x}}$
   (e) $\frac{2}{x^3}\ e^{-1/x^2}$

2. (a) $v = 50 - 19.6t$; $a = -19.6$
   (b) $v = e^t + 1$; $a = e^t$
   (c) $v = 6t^2 - 28t + 5$; $a = 12t - 28$

3. (a) tangent: $8x + y + 17 = 0$
   normal: $x - 8y - 71 = 0$
   (b) tangent: $y + 25 = 0$
   normal: $x = 3$

4. (a) $3x + 4y - 14 = 0$

   (b) $x - y - 3 = 0$

5. slope $= -\frac{4}{5}$; y-intercept $= \frac{13}{5}$

6. 8, -2

7. (a) 7.4 kW (b) 1.1×10^2 s or 1.8 minutes

8. (a) $-t^2$ (b) $\sqrt[4]{t}$

9. (a) $1.2 \times 10^{-3}\ s^{-1}$ (b) 2.6 h

10. (a) 1.3×10^{12} dps (b) 35 Ci

Review Exercise #7

1. (a) 30 (b) $12\ \frac{2}{3}$ (c) 1162.1

2. (a) $v = -2t + 6$ $s = -t^2 + 6t$

   (b) $v = \frac{4}{3}t^{3/2}$ $s = \frac{8}{15}t^{5/2} + 100$

   (c) $v = -t^2/2 + 3t + v_0$

   $s = -t^3/6 + 3t^2/2 + v_0 t$

3. (a) $y = 2x^2 + 5x + C$

   (b) $s(t) = \frac{2}{5}t^{5/2} + C$ (c) $v(t) = 3t^2 + C$

4. (a) $v(t) = -9.8t + v_0$; $s(t) = -4.9t^2 + v_0 t$

   (b) $v(t) = v_0$; $s(t) = v_0 t$

   (c) $v(t) = \frac{3}{4}t^{4/3} + v_0$; $s(t) = \frac{9}{28}t^{7/3} + v_0 t + 10$

5. (a) $\frac{x^3}{3} - 2x + C$ (b) $\frac{x^4}{2} - 2x^2 + C$

(c) $\frac{2}{3} x^{3/2} + C$ (d) $-\frac{x^4}{4} + C$

(e) $-\frac{2}{x} + C$ (f) $10\sqrt{x} + 14x + C$

6. (a) $t^2 - 3t + C$ (b) $2t^{3/2} + 4t + C$

7. (a) $v(t) = -5t + 10$; $s(t) = -\frac{5}{2}t^2 + 10t$

(b) $v(t) = \frac{2}{3}t^3$; $s(t) = t^4/6$

Review Exercise #8

1. Roots are $x = -5, 1, 3$

2. Roots are $x = -2.73, 2.07$.
Significance: $f' = 0 \Rightarrow$ tangent slope = 0

$\therefore$ curve $y = f(x)$ has maximum at $x = -2.73$ and minimum at $x = 2.07$.

3. tangent: $12x + y - 12 = 0$

normal: $x - 12y - 1 = 0$

4. (a) 0.1 (b) t^2 (c) $-\frac{2}{t}$ (d) y

(e) 0.4 (f) 100 (g) λt

5. (a) $\lambda = 8.7 \times 10^{-5}\ s^{-1}$ (b) 2.2 h

(c) 39 h

6. (a) $1.4 \times 10^{-3}\ s^{-1}$ (b) 1.4 h

7. (a) $7x^6 - 18x^2 + \frac{1}{3}x^{-2/3}$ (b) $\frac{5}{2}x^{3/2} + \frac{1}{2}x^{-3/2}$

(c) $\frac{2}{3}x^{-1/3}$ (d) $\frac{2}{5}x^{-3/5} - \frac{a}{x^2}$

(e) $\frac{4}{t^3}e^{-2/t^2}$ (f) $2x\,e^{x^2} - 4$

(g) $\frac{7}{2}x^{5/2} + \frac{1}{2}x^{-3/2}$

8. 0.0054

10. (a) $2x - 5y = 0$ (b) $25x + 10y + 6 = 0$

(c) $2x - 2y - 3 = 0$

11. (a) $-x^2 + 0.4x - 7$

(b) $v(t) = 4\sqrt{t} + 1$; $s(t) = \frac{8}{3}t^{3/2} + t + 4$

(c) $\frac{a}{x} - 10x + C$

(d) $y = 3x - 5$

12. (a) 155 (correct to 3 S.F.)

(b) $e^3 - 1$

(c) $11\frac{1}{4}$

Review Exercise #9

3. (b) 3.8×10^2 J

4. (b) GM_eM_s/R_e

5. (a) $T = I\frac{d\omega}{dt}$ (b) $V = L\frac{di}{dt}$

6. (a) 9.2 h (b) $-7.0\ e^{-0.35t}$

   (c) 19 mgGd/kgD_2O (d) 1.9 mgGd/kgD_2O per hour

   (e) 1.2 mgGd/kgD_2O, different from (d) since C'(t) is exponential, not linear in time.

   (f) 1.7 mgGd/kgD_2O.

7. (a) 5.3×10^8 N

   (b) 0.13 MPa

   (c) 39 m vertically above "V" bottom

221.40-3 Assignment

1. ±1.73 2. -2, 4

3. $\frac{3}{4}$, 3 4. $\frac{4}{3}$

5. -0.37, 5.37 6. $\frac{-1 \pm \sqrt{-23}}{4}$ (no real roots)

L.C. Haacke