

# Mathematics for Actuarial Science: Answer sheet 1

## Sheet 1

- $x = \sqrt{\frac{b}{a-c^2d}}$ , 2.
- $(p^2 + q) + 2p\sqrt{q}$ ,  
 $(p^2 + 3pq) + (3p^2 + q)\sqrt{q}$ .
- $32 - 240x + 720x^2 - 1080x^3 + 810x^4 - 243x^5$ .
- $A = 44, B = 924, C = 12320$ .
- 1215.
- $\frac{1}{3}$ , 1.
- $3x^2 - 3x - 2 = 0$ .
- $k \leq -6$  or  $k \geq 2$ , (a)  $-155$ ,  
(b)  $x^2 - 14x - 479 = 0$ .
- $x^4 + 3x^3 - 2x + 1$ .
- $(x - 4)(x^2 - 4x + 13)$ , 4.
- $(x - 2)(x - 3)(2x + 1)$ .
- $a = -1, b = 4$ .
- $k = 9$ .
- $-\frac{2}{(1+x)^2} + \frac{3}{1+3x}$ .
- $\frac{1}{1-2x} - \frac{2x}{1+x^2}$ .
- $(x^2 + 2\sqrt{3}x + 4)(x^2 - 2\sqrt{3}x + 4)$ ,  
 $\frac{x+2\sqrt{3}}{16\sqrt{3}(x^2+2\sqrt{3}x+4)} - \frac{x-2\sqrt{3}}{16\sqrt{3}(x^2-2\sqrt{3}x+4)}$ .
- $1 - \frac{1}{x^2} - \frac{2}{3(x+1)} - \frac{1-2x}{3(x^2-x+1)}$ .
- $\frac{1}{3}n(4n^2 - 1)$ .
- (a)  $f^{-1}(x) = \frac{2x+1}{x-3}, x \neq 3$ .  
(b)  $f(f(x)) = \frac{10x+1}{x+5}, x \neq -5, x \neq 2$ .
- (a)  $x \geq 0$ , (b) 0, 8,  
(c) i. 2, 6, ii. 1,  $-\frac{4}{3}$ .
- (a)  $\mathbb{R}, y \geq -\frac{1}{4}$ , (b)  $x \leq 1$  or  $x \geq 2$ ,  
 $y \geq 0$ , (c)  $\mathbb{R}, y \geq 0$ .
- (a)  $-\frac{2}{3} < x < 2$ , (b)  $x < \frac{1}{2}$ .
- 0.524, 2.618, 3.386, 6.034.
- 26.6, 90, 206.6, 270.
- $(n \pm \frac{1}{6})\pi$ .
- $\cos 4x = 2 \cos^2 2x - 1$   
 $= 8 \sin^4 x - 8 \sin^2 x + 1$ ,  
 $\sin x = \pm \frac{1}{2} \sqrt{2 \pm \sqrt{2(1+a)}}$ .
- 1.231, 3.142, 5.052.
- $R = 5, \alpha = 0.6435$ . (a) i. 1.80, 5.77,  
ii. 0.21, 0.64, 2.31, 4.40.  
(b) max 1 when  $\theta = 3.785$ ,  
min  $\frac{1}{11}$  when  $\theta = 0.644$ .
- $y = x^4$ .
- $\ln 2, \ln 3$ .
- (a)  $p - \frac{1}{2}q$ , (b)  $a^2b^{-3}$ .
- (a)  $\frac{1}{3}, \frac{2}{3}$ , (b) 4,  $16\sqrt{2}$ .
- $x < -6, x > -1$ .
- $2 < x < \frac{5}{2}$ .
- (a)  $-1 < x < \frac{1}{2}$  or  $x > 3$ ,  
(b)  $u < -\ln 2$  or  $u > \ln 3$ .

## Sheet 2

- $a = 25, d = -3$ , (b)  $S = -3810$ .
- $n = 33, d = \frac{7}{2}, S = 1450$ .