

Mathematics for Actuarial Science: Answer sheet 3

Sheet 5

- (a) $\frac{29}{4}$, (b) 0.
- $y = 2x - 2$.
- $-2xe^{-x^2}$, $2(2x^2 - 1)e^{-x^2}$, $\pm \frac{1}{\sqrt{2}}$.
- Max: 9, Min: 8.
- (a) $8x + \frac{1}{x^2}$, $8 - \frac{2}{x^3}$,
(b) $-\frac{1}{2}$, minimum at $(-\frac{1}{2}, 0)$,
(c) $-\frac{1}{2}$, 1.
- $27\frac{1}{2}$.
- $\frac{2x-2}{x^2-2x+2}$, $\frac{1}{2} \ln 2$.
- $\frac{1}{4} \ln 2$.
- $\frac{5}{18}$.
- $\frac{1}{1+2x} + \frac{5}{(1+2x)^2} - \frac{2}{1+x}$.
- $\frac{1}{3} \sin^3 x + C$.
- $\frac{e^{2x}}{2} - e^x + C$.
- $\frac{(4x-3)^{5/2}}{40} + \frac{(4x-3)^{3/2}}{8} + C$.
- $\frac{1}{2} \tan^2 x + C$.
- $-2 \cos \sqrt{x} + C$.
- $\frac{(x-5)^7}{7} + \frac{8(x-5)^6}{3} + \frac{64(x-5)^5}{5} + C$.
- $-\frac{1}{3} \ln |1 + \cos 3\theta| + C$.
- $-\frac{1}{10} \cos 10t - \frac{1}{4} \cos 4t + C$.
- $\frac{3}{8}t + \frac{1}{4} \sin 2t + \frac{1}{32} \sin 4t + C$.

Sheet 6

- (a) $\frac{1}{2}x^2 \ln x - \frac{1}{4}x^2 + C$.
(b) $\frac{1}{2}x^2(\ln x)^2 - \frac{1}{2}x^2 \ln x + \frac{1}{4}x^2 + C$.
- (a) $\frac{2}{9}(3x+8)^{3/2} + C$.
(b) $(3x+8)e^x - 3e^x + C$.
(c) $\frac{2}{15}(3x+8)^{5/2} - \frac{16}{9}(3x+8)^{3/2} + C$.
- $\frac{1}{4}x^2 - \frac{1}{2} \sin x \cos x + \frac{1}{4} \sin^2 x + C$.
- $-\frac{2}{9}\pi$.
- $I_n = \frac{1}{2}x^n e^{2x} - \frac{n}{2}I_{n-1}$,
 $\frac{1}{4}e^{2x}(2x^4 - 4x^3 + 6x^2 - 6x + 3) + C$.
- (a) $\frac{1}{3} \ln 7$.
- $2\sqrt{2}$.
- (a) 8, (b) -4, (c) $\frac{1}{3} + 2 \ln 2$.
- $\frac{7}{11}$.
- 0.
- $\frac{3}{\sqrt{10}} \tan^{-1} \left(x\sqrt{\frac{2}{5}} \right) + C$.