

*Even More Calculus***Answers****1 Derivatives of Trig Functions**

1. (a) $2 \cos 2x$ (b) $\frac{1}{2} \cos \frac{1}{2}x$
 (c) $100 \cos 100x$ (d) $-3 \sin 3x$
2. $-k \sin kx$; $k \sec^2 kx$
3. (a) $4 \sin 2x \cos 2x$ (b) $2(\cos^2 2x - \sin^2 2x)$
 (c) $-\frac{3}{2} \cos^2 \left(\frac{1}{2}x\right) \sin \left(\frac{1}{2}x\right)$ (d) $4 \tan 2x \sec^2 2x$
4. $-\cos x \operatorname{cosec}^2 x$; $\tan x \sec x$; $\sec x + c$

2 Rates of Change

1. $0.377 \text{ cm}^2/\text{s}$
2. $0.2 \text{ cm}^2/\text{s}$
3. $0.0402 \text{ cm}^3/\text{s}$, $x = \frac{1}{2}$
4. (a) 14π (b) $\frac{4}{3}$ (c) 3

3 Integration by Substitution

1. (a) $\frac{1}{10}(x^2 - 5)^5$ (b) $-\frac{1}{3}(1 - x^2)^{\frac{3}{2}}$
 (c) $\frac{1}{5} \sin^5 x$ (d) $\frac{2}{3}(1 + e^x)^{\frac{3}{2}}$
3. $\frac{(\pi+2)}{216}$

4 Integration by Parts

1. $\frac{x^3}{3} \ln x - \frac{x^4}{9} + C$
3. $\frac{2}{3}$
4. $\frac{1}{4}x^4 \ln(4x) - \frac{x^4}{16} + C$
5. $\frac{1}{4}(2x^2 \sin 2x + 2x \cos 2x - \sin 2x) + C$
7. (a) $x^2 e^x - 2x e^x + 2e^x$
 (b) $-x^2 e^{-x} - 2x e^{-x} - 2e^{-x}$

5 First Order Differential Equations

1. $y^2 = \frac{2}{3} \left(\frac{5x^3}{3} + \frac{3}{2} \right)$

2. $y = 2x^3$

3. $y = \frac{1}{2-x}$

4. $y = \frac{1}{2} \ln(x^2 + 1)$

5. $y^2 + 2(x + 1)e^{-x} = A$

6. $y = -1 + A(x + 2)$

7. $x^2 = A(1 + y^2)$

8. $k = \ln 2, n = n_0 2^t$