

Q1 a)  $2x e^{-5x^2} + x^2 e^{-5x^2} - 10x$   
 $= 2x e^{-5x^2} - 10x^3 e^{-5x^2}$

b)  $\frac{(2 - \sec(3x)) \cdot \frac{1}{2} x^{-1/2} - (\sec(3x) \tan(3x) \cdot 3) \sqrt{x}}{(2 - \sec(3x))^2}$

c)  $x^{4x} = e^{4x \ln(x)}$        $(x^{4x})' = e^{4x \ln(x)} \cdot (4x \cdot \frac{1}{x} + 4 \ln(x))$   
 $= x^{4x} (4 + 4 \ln(x))$

d)  $\frac{1}{\tan(4x)} \cdot \frac{1}{\sec^2(4x)} \cdot 4$

e)  $\frac{1}{1 + (\frac{2}{\sqrt{x}})^2} \cdot 2 \cdot \frac{1}{2} x^{-3/2} = \frac{-x^{-3/2}}{1 + 4/x}$

f)  $\frac{-1}{\sqrt{1 - (1-x)^2}} \cdot -1 = \frac{1}{\sqrt{1 - (1-x)^2}} = \frac{1}{\sqrt{2x - x^2}}$

Q2 a)  $2 \cdot e^{-5x^2} + 2x \cdot e^{-5x^2} - 10x - 30x^2 e^{-5x^2} - 10x^3 e^{-5x^2} - 10x$   
 $= e^{-5x^2} (2 - 50x^2 + 100x^4)$

b)  $= \left( \frac{1 - \frac{1}{2} \sec(3x) - 3x \sec(3x) \tan(3x)}{\sqrt{x} (2 - \sec(3x))^2} \right)'$   
 $= \frac{\sqrt{x}' (2 - \sec(3x))^2 \left[ -\frac{1}{2} \sec(3x) \tan(3x) \cdot 3 - 3 \sec(3x) \tan(3x) - 3x (\sec(3x) \tan(3x))' \right]}{x (2 - \sec(3x))^4} - \dots$

$$= \sqrt{x} (2 - \sec(3x))^2 \left[ \frac{9}{2} \sec(3x) \tan(3x) - 3x (\sec(3x) \tan(3x) \tan(3x) \cdot 3 + \sec(3x) \sec^2(3x) \cdot 3) \right] \\ - \left[ \frac{1}{2} x^{-1/2} (2 - \sec(3x))^2 + \sqrt{x} 2(2 - \sec(3x)) \cdot -\sec(3x) \tan(3x) \cdot 3 \right] \left( \begin{matrix} 1 - \frac{1}{2} \sec(3x) \\ -3x \sec(3x) \tan(3x) \end{matrix} \right)$$

---


$$\sqrt{x} (2 - \sec(3x))^2.$$

$$= x (2 - \sec(3x))^2 \sec(3x) \tan(3x) \left[ -\frac{9}{2} \tan(3x) - 9x \tan^2(3x) + 3 \sec^2(3x) \right] \\ - \left[ \frac{1}{2} (2 - \sec(3x))^2 + x 6 (2 - \sec(3x)) (-\sec(3x) \tan(3x)) \right] \left( \begin{matrix} 1 - \frac{1}{2} \sec(3x) \\ -3x \sec(3x) \tan(3x) \end{matrix} \right)$$

---


$$x (2 - \sec(3x))^2.$$

$$c) (e^{4x \ln(x)} (4 + 4 \ln(x)))' = (4e^{4x \ln(x)})' \\ = e^{4x \ln(x)} (4 + 4 \ln(x))^2 + e^{4x \ln(x)} \cdot \frac{4}{x}$$

$$d) \left( \frac{4}{\tan(4x) \sec^4(4x)} \right)' = \left( \frac{4 \cos^3(4x)}{\sin(4x)} \right)' = 4 \frac{\sin 4x \cdot 3 \cos^2 4x \cdot (-\sin 4x) + \cos^3 4x}{\sin^2 4x} \\ = 4 \frac{3 \cos^2 4x (-\sin^2 4x) + \cos^3 4x}{\sin^2 4x}$$

$$d) (4 \cot(4x) \cos^2(4x))' = 4 (-\operatorname{cosec}(4x) \cdot 4) \cos^2(4x) \\ + 4 \cot(4x) \cdot 2 \cos(4x) \cdot (-\sin(4x)) \cdot 4$$

$$e) \frac{(1 + \frac{4}{x}) (\frac{3}{2} x^{-5/2}) - (-4x^{-2}) (-x^{-3/2})}{(1 + \frac{4}{x})^2}$$



$$f) \left( (2x-x^2)^{-1/2} \right)' = -\frac{1}{2} (2x-x^2)^{-3/2} (2-2x)$$

3

Q3 a)  $h'(x) = f'(x)g(x) + f(x)g'(x)$

$$h'(-3) = f'(-3)g(-3) + f(-3)g'(-3)$$

$$= 1 \cdot -\frac{1}{2} + 0 \cdot -\frac{1}{2} = -\frac{1}{2}$$

b)  $h'(x) = f'(g(x)) \cdot g'(x)$

$$h'(4) = f'(g(4)) \cdot g'(4) = f'(-1) \cdot -\frac{1}{2} = -\frac{1}{4}$$

Q4  $4x^2 + 2y^2 = 18$        $8x + 4yy' = 0$

at  $(-2, 1)$  :  $-16 + 4y' = 0$        $y' = 4$

$$y-1 = 4(x+2)$$

Q5  $y^2 + x^2yy' + 4xy^2 + 2x^2y^2y' = -\cos(xy) \cdot (y + xy')$

$$y'(2xy + 4x^2y + \cos(xy) \cdot x) = -y^2 - 4xy^2 - \cos(xy)y$$

$$y' = -\frac{y^2 + 4xy^2 + \cos(xy)y}{2xy + 4x^2y + x\cos(xy)}$$

Q6  $V = \frac{4}{3}\pi r^3$

$$A = 4\pi r^2$$

$$r = \sqrt{\frac{A}{4\pi}} \left. \vphantom{r} \right\} V = \frac{4}{3}\pi \frac{A^{3/2}}{4^{3/2}\pi^{3/2}} = \frac{A^{3/2}}{6\sqrt{\pi}}$$

$$\frac{dV}{dt} = \frac{1}{6\sqrt{\pi}} \cdot \frac{3}{2} A^{1/2} \frac{dA}{dt}$$

$$\frac{dV}{dt} = 10$$

$$r=10 \Rightarrow A = 400\pi$$

$$10 = \frac{1}{4\sqrt{\pi}} \sqrt{400\pi} \frac{dA}{dt} \quad \frac{dA}{dt} = \frac{10}{20} \cdot 4 = 2 \text{ cm/sec.}$$

Q7

$$f(x) = x^{1/3}$$

$$f(27) = 3$$

$$f'(x) = \frac{1}{3} x^{-2/3}$$

$$f'(27) = \frac{1}{27}$$

$$f(26) \approx f(27) + (-1)f'(27) = 3 - \frac{1}{27} = 2\frac{26}{27}$$

PLEASE CONTACT THE COURSE COORDINATOR FOR MORE INFORMATION

Name: \_\_\_\_\_  
 ID: \_\_\_\_\_  
 Section: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Instructor: \_\_\_\_\_  
 Office Phone: \_\_\_\_\_  
 Home Phone: \_\_\_\_\_  
 Fax Number: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

COURSE COORDINATOR  
 NAME: \_\_\_\_\_  
 PHONE: \_\_\_\_\_  
 EMAIL: \_\_\_\_\_

NAME	SECTION	DATE	SCORE

PLEASE CONTACT THE COURSE COORDINATOR FOR MORE INFORMATION

COURSE COORDINATOR  
 NAME: \_\_\_\_\_  
 PHONE: \_\_\_\_\_  
 EMAIL: \_\_\_\_\_

COURSE COORDINATOR  
 NAME: \_\_\_\_\_  
 PHONE: \_\_\_\_\_  
 EMAIL: \_\_\_\_\_