

Supplementary Exercises – Chapter 9 (answers below)

Differentiate. Do NOT simplify.

1.  $f(x) = (5 - 2x)^{10}$

2.  $f(x) = \frac{1}{(4x+1)^5}$

3.  $f(x) = (\sqrt{3}x^2 + x - \sqrt{11})^{-8}$

4.  $f(x) = \sqrt{x^2 + 2x + 3}$

5.  $f(x) = \frac{1}{\sqrt{x^2 + 1}}$

6.  $f(x) = (3x^2 + 7)^2(5 - 3x)^3$

7.  $f(x) = \left(\frac{x^2 + x}{1 - 2x}\right)^4$

8.  $f(x) = \sqrt{x + \sqrt{x}}$

9. Given that  $\frac{d}{dx} \sin x = \cos x$  and  $\frac{d}{dx} \tan x = \sec^2 x$ , find:

(a)  $f'(x)$  for  $f(x) = \sin(x^2 + 3x)$

(b)  $g'(x)$  for  $g(x) = \sin(\tan x)$

(c)  $h'(x)$  for  $h(x) = \sin(\tan(6x))$

(d)  $j'(x)$  for  $j(x) = \tan^5(\sin x)$

10. Given  $f$  and  $g$  differentiable at  $x = 5$  and  $x = 7$ , such that:

$$f(5) = -3, \quad f'(5) = 10, \quad f(7) = 0, \quad f'(7) = 20, \quad g(5) = 7, \quad g'(5) = \frac{1}{4}, \quad g(7) = \frac{3}{5}, \quad g'(7) = \frac{2}{3},$$

(a) Find  $(f \circ g)'(5)$

(b) Can you find  $(g \circ f)'(5)$ ?

11. Use the fact that  $|x| = \sqrt{x^2}$  to find  $f'(x)$  for  $f(x) = |x|$ .

12. Find the equation of the line tangent to  $f(x) = \frac{1}{\sqrt{2x+7}}$  at the point  $(1, \frac{1}{3})$ .

Answers:

1.  $10(5-2x)^9(-2)$       2.  $-5(4x+1)^{-6}(4)$       3.  $-8(\sqrt{3}x^2+x-\sqrt{11})^{-9}(2\sqrt{3}x+1)$

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

6.  $2(3x^2+7)(6x)(5-3x)^3 + 3(5-3x)^2(-3)(3x^2+7)^2$

7.  $4\left(\frac{x^2+x}{1-2x}\right)^3\left(\frac{(2x+1)(1-2x)-2(x^2+x)}{(1-2x)^2}\right)$       8.  $\frac{1}{2}(x+\sqrt{x})^{-\frac{1}{2}}\left(1+\frac{1}{2}x^{-\frac{1}{2}}\right)$

9. (a)  $\cos(x^2+3x)(2x+3)$       (b)  $\cos(\tan x) \cdot \sec^2 x$       (c)  $\cos(\tan(6x)) \cdot \sec^2(6x) \cdot 6$

(d)  $[5\tan^4(\sin x)][\sec^2(\sin x)]\cos x$

10. (a) 5      (b) No. You would need to have a value for  $g'(-3)$ .

11.  $f'(x) = \frac{x}{|x|}$

12.  $y - \frac{1}{3} = -\frac{1}{27}(x-1)$