Calculus Review 1.1 – 1.4

Name Key

Derivatives of Trigonometric Functions

$\frac{d}{dx}\sin x = \cos x$	$\frac{d}{dx}\tan x = \sec^2 x$	$\frac{d}{dx}\cot x = -\csc^2 x$
$\frac{d}{dx}\cos x = -\sin x$	$\frac{d}{dx}\sec x = \sec x \tan x$	$\frac{d}{dx}\csc x = -\csc x \cot x$

For #1-2: a) find the slope of the curve at the given point, then

b) find the equation of the tangent line at that point whose x-coordinate is given.

1. $y = 4x^2 + 3x - 9$ at $x = 2$

$y' = 8x + 3$ $m = 8(2) + 3$

a.) $m = 19$

$y = 4(2)^2 + 3(2) - 9$

$16 + 6 - 9 = 13$

$13 = 19(2) + b$

$13 = 38 + b$ $b = -25$

b) $y = 19x - 25$

2. $y = x^2 + x$ at $x = -1$

$y' = 2x + 1$ $m = 2(-1) + 1$

a.) $m = -1$

$y = (-1)^2 + (-1)$ $y = 0$

$0 = -1(-1) + b$

$0 = 1 + b$

$-1 = b$

$y = -1x - 1$

3. If $y = (5x + 4)^9$ find y′ and y″

$y' = 9(5x+4)^8 \cdot 5$

$y' = 45(5x+4)^8$

$y'' = 360(5x+4)^7 \cdot 5$

$y'' = 1800(5x+4)^7$

Differentiate.

4. $\sin x^5$

$\cos x^5 \cdot 5x^4$

$5x^4(\cos x^5)$

5. $\tan 8x$

$\sec^2 8x \cdot 8$

$8(\sec 8x)^2$

OR

$8\sec^2(8x)$

6. $\cos^3 x$ $(\cos x)^3$

$3(\cos x)^2 \cdot (-\sin x)$

$-3(\sin x)(\cos x)^2$

OR

$-3 \cdot \sin x \cdot \cos^2 x$

Differentiate.

7. $g(x) = (1 - x + x^2)(3x^4)$

$f = (1 - x + x^2) \quad g = 3x^4$

$f' = 2x - 1 \quad g' = 12x^3$

$(1 - x + x^2)(12x^3) + (3x^4)(2x - 1)$

$12x^3 - 12x^4 + 12x^5 + 6x^5 - 3x^4$

$\boxed{18x^5 - 15x^4 + 12x^3}$

8. $b(x) = (\sqrt{x+1})(x^2 + 3)$

$f = (x+1)^{\frac{1}{2}} \quad f' = \frac{1}{2}(x+1)^{-\frac{1}{2}}$

$g = x^2 + 3 \quad g' = 2x$

$\boxed{(x+1)^{\frac{1}{2}}(2x) + (x^2+3)\left[\frac{1}{2}(x+1)^{-\frac{1}{2}}\right]}$

9. $q(x) = \frac{1}{\sqrt{2x+4}}$

$f = 1 \quad g = (2x+4)^{\frac{1}{2}}$

$f' = 0 \quad g' = \frac{1}{2}(2x+4)^{-\frac{1}{2}} \cdot 2 = (2x+4)^{-\frac{1}{2}}$

$$\frac{(2x+4)^{\frac{1}{2}}(0) - 1(2x+4)^{-\frac{1}{2}}}{(\sqrt{2x+4})^2} =$$

$$\boxed{\frac{-(2x+4)^{-\frac{1}{2}}}{2x+4}}$$

10. $h(x) = (4x^3 + 2x^2 - 5x)^4$

$4(4x^3 + 2x^2 - 5x)^3 \cdot (12x^2 + 4x - 5)$

$\boxed{(48x^2 + 16x - 20)(4x^3 + 2x^2 - 5x)^3}$

11. $f(x) = x^2 - 5x + \sqrt{x} - 34$

$\boxed{f'(x) = 2x - 5 + \frac{1}{2}x^{-\frac{1}{2}}}$

12. $y = \frac{x^2}{7x+3}$

$f = x^2 \quad f' = 2x$

$g = 7x + 3 \quad g' = 7$

$$\frac{(7x+3)(2x) - (x^2)(7)}{(7x+3)^2} = \frac{14x^2 + 6x - 7x^2}{(7x+3)^2}$$

$$\boxed{\frac{7x^2 + 6x}{(7x+3)^2}}$$