

MATH 2554 : 3.7-3.8 Review Sheet

Some Problems I recommend

- Section 3.1 : 17, **32**
- Section 3.2 : 20, **25, 28**, 29a
- Section 3.3 : 12, 13, **14**, 16, 25, 26, 30, 34, 45, 64, 66
- Section 3.4 : 19, 22, 28, **29, 40**, 45, **61**, 76, 79, **81**
- Section 3.5 : **13**, 16, **19**, 28, **29**, 33, 45, 50
- Section 3.6 : **21, 23, 28**
- Section 3.7 : 20, 22, 38, 40, **55, 69**
- Section 3.8 : 7, 14, 17, **26**, 34, **46**, 51, **52**
- Section 3.9 : 15, **19**, 23, **32**, 34, 37, **39**, **42**, 47, **63, 69**

Especially important ones in **bold**

Key Concepts

Basic derivative Rules :

1. $\frac{d}{dx}c = 0$
2. $\frac{d}{dx}f(x) + g(x) = f'(x) + g'(x)$
3. $\frac{d}{dx}f(x)g(x) = f'(x)g(x) + f(x)g'(x)$
4. $\frac{d}{dx}x^n = nx^{n-1}$
5. $\frac{d}{dx}cf(x) = cf'(x)$
6. $\frac{d}{dx}f(x) - g(x) = f'(x) - g'(x)$
7. $\frac{d}{dx}\frac{f(x)}{g(x)} = \frac{g(x)f'(x) - f(x)g'(x)}{g(x)^2}$
8. $\frac{d}{dx}f(g(x)) = f'(g(x)) \cdot g'(x)$

The above show the following rules : constant rule (1), constant multiple rule (5), sum rule (2 & 6), product rule (3), quotient rule (7), power rule (4), chain rule (8)

Trig derivatives :

1. $\frac{d}{dx}\sin x = \cos x$
2. $\frac{d}{dx}\cos x = -\sin x$
3. $\frac{d}{dx}\tan x = \sec^2 x$
4. $\frac{d}{dx}\cot x = -\csc^2 x$
5. $\frac{d}{dx}\sec x = \sec x \tan x$
6. $\frac{d}{dx}\csc x = -\csc x \cot x$

3.7 Chain Rule Forms :

$$\frac{d}{dx}f(g(h(x))) = f'(g(h(x))) \cdot g'(h(x)) \cdot h'(x)$$

$$\frac{d}{dx}\sin(f(x)) = \cos(f(x)) \cdot f'(x)$$

$$\frac{d}{dx}f(x)^n = n(f(x))^{n-1} \cdot f'(x)$$

$$\frac{d}{dx}e^{f(x)} = e^{f(x)} \cdot f'(x)$$

3.8 Implicit Differentiation : Just as $y = x$ gives the derivation $y' = 1$, with the chain rule we can use **implicit differentiation** to find $y^2 = x$ gives $2y \cdot y' = 1$ which reduces to $y' = \frac{1}{2y}$. To find the second derivative, simply repeat and replace any y' with your first answer. Using the previous answer this gives $y'' = -\frac{1}{2}y^{-2} \cdot y' = -\frac{1}{2}y^{-2} \cdot \frac{1}{2y} = -\frac{1}{4y^3}$