5.1 - 5.4 Notes

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1 The Pythagorean theorem

$$a^2 + b^2 - 2ab\cos C = c^2 \tag{1}$$
$$a^2 + b^2 \because -2ab\cos C = 2ab \cdot 0 = 0 \tag{2}$$
$$\frac{d}{dx}(e^x) = e^x \cdot \ln e = e^x \cdot 1 \tag{3}$$
$$\therefore \ln_{e^?} = e^1 \tag{4}$$
$$\frac{d}{dx}(b^x) = b^x \cdot \ln b = \ln b \cdot (b^x) \tag{5}$$
$$\int b^x dx = \frac{b^x}{\ln b} + C \tag{6}$$
$$\frac{d}{dx}(\ln x) = \frac{1}{x} \tag{7}$$
$$\frac{d}{dx}(log_b x) = \frac{d}{dx}\left(\frac{log(x)}{log(b)}\right) \Rightarrow log_4(64) = \frac{log(64)}{log(4)} = 3 \tag{8}$$
$$\therefore = \frac{d}{dx}\left(\frac{\ln x}{\ln b}\right) \tag{9}$$
$$= \frac{d}{dx}\left(\frac{1}{\ln(b)}\right)\ln x \tag{10}$$
$$= \frac{1}{x\ln b} \tag{11}$$

2 A glance at integration by parts

$$\int \ln x dx \tag{1}$$
$$= x\ln x - x \tag{2}$$

3 01/09/24 Warm-up

1.

$$f(x) = x + \sin(x) \tag{1}$$
$$f'(x) = 1 + \cos(x) \tag{2}$$

4 The tangent integral

$$\int \tan x dx \tag{1}$$
$$= \int \frac{\sin x}{\cos x} dx,\ u = \cos x,\ du = \sin x dx \tag{2}$$
$$= -\int \frac{1}{u} du \tag{3}$$
$$= -\ln|u| + C = -\ln|\cos x| + C = \tan x \tag{4}$$

5 The secant integral

$$\int \sec x dx \left(\frac{\sec x + \tan x}{\sec x + \tan x}\right) \tag{1}$$
$$= \int \frac{\sec^2 x + \sec x + \tan x}{\sec x + \tan x} dx\ u = \sec x + \tan x\ du = \sec x \tan x + \sec^2 x dx \tag{2}$$
$$\int \frac{1}{u} dx \tag{3}$$
$$= \ln|u| + C \tag{4}$$
$$= \ln|\sec x + \tan x| + C \tag{5}$$

6 The cosecant integral

$$\int \csc x dx \tag{1}$$
$$= \tag{2}$$