

AP Calculus AB

Integration Review #2

$$1) \int_0^1 x(x^2+1)^{-1} dx \quad \text{check: } \frac{2x}{x^2+1}$$

$$\left[\frac{1}{2} \ln(x^2+1) + C \right]_0^1$$

$$\left[\frac{1}{2} \ln(2) \right] - \left[\frac{1}{2} \ln 1 \right]$$

$$\frac{1}{2} \ln 2$$

$$\ln \sqrt{2}$$

$$2) \int_0^{\pi/2} \cos^2 x \sin x dx$$

$$\int_0^{\pi/2} (\cos x)^2 \sin x dx \quad \text{check: } 3(\cos x)^2(-\sin x)$$

$$\left[-\frac{1}{3} (\cos x)^3 + C \right]_0^{\pi/2}$$

$$\left[-\frac{1}{3} (\cos \frac{\pi}{2})^3 \right] - \left[-\frac{1}{3} (\cos 0)^3 \right]$$

$$\boxed{\frac{1}{3}}$$

$$3) \int_1^2 (3x-2)^3 dx \quad \text{check: } 4(3x-2)^2 \cdot 3$$

$$\left[\frac{1}{12} (3x-2)^4 + C \right]_1^2$$

$$\left[\frac{1}{12} (4)^4 \right] - \left[\frac{1}{12} (1)^4 \right]$$

$$4) \int_{-1}^0 e^{-x} dx$$

$$\left[-e^{-x} + C \right]_{-1}^0$$

$$[-1] - [-e^{-1}]$$

$$\boxed{-1 + \frac{1}{e}}$$

$$5) \int_1^3 \frac{6x-2}{x} dx$$

$$\int_1^3 \left[6 - \frac{2}{x} \right] dx$$

$$\left[6x - 2 \ln x + C \right]_1^3$$

$$[18 - 2 \ln 3] - [6 - 2 \ln 1]$$

$$\boxed{12 - 2 \ln 3}$$

$$6) \lim_{x \rightarrow 5} \frac{2x^2 - 9x - 5}{x - 5} \rightarrow \frac{0}{0}$$

Using L'Hopital's Rule

$$\lim_{x \rightarrow 5} \frac{4x - 9}{1} = \boxed{11}$$

$$8) \int \frac{1}{\sqrt{16-x^2}} dx = \arcsin\left(\frac{x}{4}\right) + C$$

$$7) f'(x) = 3x^2 + 4$$

$$f(x) = x^3 + 4x + C$$

$$14 = 1 + 4 + C$$

$$9 = C$$

$$f(x) = x^3 + 4x + 9$$

$$f(1) = 14$$

$$9) \int_0^1 x^2(15-4x) dx$$

$$\int_0^1 (15x^2 - 4x^3) dx$$

$$\left[5x^3 - x^4 + C \right]_0^1 = [5 - 1] = \boxed{4}$$

$$10) 3y^2 - 4x = 7xy$$

$$6y \frac{dy}{dx} - 4 = 7x \frac{dy}{dx} + 7y$$

$$6y \frac{dy}{dx} - 7x \frac{dy}{dx} = 7y + 4$$

$$(6y - 7x) \frac{dy}{dx} = 7y + 4$$

$$\frac{dy}{dx} = \frac{7y + 4}{6y - 7x}$$