Name: Richard

QUIZ 12

MATH 200, SECTION 1

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1. Use the fundamental theorem of calculus to find the definite integrals.

(a) $\int_1^e \frac{1}{x}\,dx = \Big[\ln|x|\Big]_1^e = \ln|e| - \ln|1| = 1 - 0 = \boxed{1}$

(b) $\int_{-1}^{1} (x^2 + x)\,dx = \left[\frac{x^3}{3} + \frac{x^2}{2}\right]_{-1}^{1} = \left(\frac{1^3}{3} + \frac{1^2}{2}\right) - \left(\frac{(-1)^3}{3} + \frac{(-1)^2}{2}\right)$

$= \left(\frac{1}{3} + \frac{1}{2}\right) - \left(-\frac{1}{3} + \frac{1}{2}\right)$

$= \frac{1}{3} + \frac{1}{2} + \frac{1}{3} - \frac{1}{2} = \boxed{\frac{2}{3}}$

(c) $\int_0^1 \frac{1}{1+x^2}\,dx = \Big[\tan^{-1}(x)\Big]_0^1 = \tan^{-1}(1) - \tan^{-1}(0)$

$= \frac{\pi}{4} - 0 = \boxed{\frac{\pi}{4}}$

2. Find $\int \cos^6(x)\sin(x)\,dx = \int (\cos(x))^6 \sin(x)\,dx$

Let $u = \cos(x)$

so $\frac{du}{dx} = -\sin(x)$

and $du = -\sin(x)\,dx$

so $-du = \sin(x)\,dx$

$= \int u^6(-du) = -\int u^6\,du$

$= -\frac{u^7}{7} + C$

$= \boxed{-\frac{\cos^7(x)}{7} + C}$