Recitation notes

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1. Section 5.3 problems

   (a) Problem 19: Evaluate the integral

   $$\int_1^3 x^2 + 2x - 4 \, dx \tag{1}$$

   Solution.

   $$\int_1^3 x^2 + 2x - 4 \, dx = \left(\frac{1}{3}x^3 + x^2 - 4x\right)\Big|_1^3 \tag{2}$$

   $$= \frac{1}{3}27 + 9 - 12 - \left(\frac{1}{3} + 1 - 4\right) \tag{3}$$

   $$= 9 - \frac{1}{3} \tag{4}$$

   $$= \frac{26}{3} \tag{5}$$

   $\square$

   (b) Problem 39: Evaluate the integral

   $$\int_{1/\sqrt{3}}^{\sqrt{3}} \frac{8}{1 + x^2} \, dx \tag{6}$$

   Solution.

   $$\int_{1/\sqrt{3}}^{\sqrt{3}} \frac{8}{1 + x^2} \, dx = 8 \arctan x \Big|_{1/\sqrt{3}}^{\sqrt{3}} \tag{7}$$

   $$= 8(\pi/3 - \pi/6) \tag{8}$$

   $$= 4\pi/3. \tag{9}$$

   $\square$

2. Section 5.5 Problems

(a) Problem 15: Compute the indefinite integral with u substituion

$$\int \cos^3 \theta \sin \theta \, d\theta \tag{10}$$

Solution. Let $u = \cos \theta$. Then

$$\int \cos^3 \theta \sin \theta \, d\theta = -\int u^3 \, du \tag{11}$$

$$= -\frac{1}{4} u^4 + C \tag{12}$$

$$= -\frac{1}{4} \cos^4 \theta + C. \tag{13}$$

$\square$

(b) Problem 21: Compute the indefinite integral by using u substitution

$$\int \frac{(\ln x)^2}{x} \, dx \tag{14}$$

Solution. Let $u = \ln x$. Then

$$\int \frac{(\ln x)^2}{x} \, dx = \int u^2 \, du \tag{15}$$

$$= \frac{1}{3} u^3 + C \tag{16}$$

$$= \frac{1}{3} (\ln x)^3 + C. \tag{17}$$

$\square$