Workshop Exercises: Techniques of Integration II (Solutions)

1. Evaluate the definite integrals using the Fundamental Theorem of Calculus.

   a. $\int_0^5 3x^2 dx = 125$

   b. $\int_0^3 (x^2 - 7x + 12)\, dx = \frac{27}{2}$

   c. $\int_0^{\pi} \sin(x)\, dx = 2$

   d. $\int_{\pi}^{\frac{3\pi}{2}} \cos(x)\, dx = -1$

   e. $\int_1^e \frac{1}{x} dx = 1$

   f. $\int_0^1 \frac{1}{1+x^2} dx = 0.78540$

2. Evaluate each indefinite integral using substitution.

   a. $\int \frac{1}{x^2+4x+4} dx = -\frac{1}{x+2} + c$

   b. $\int 2x\sqrt{x^2+12}dx = 2\sqrt{x^2+12+c}$

   c. $\int -5x^3(x^2-4)^4 dx = -5\left(\frac{x^{12}}{12} - \frac{8x^{10}}{5} + 12x^8 - \frac{128x^6}{3} + 64x^4\right) + c$

   d. $\int \frac{\sin(2x)}{\cos(2x)} dx = -\frac{1}{2}\log(cos(2x)) + c$

   e. $\int \frac{lnx}{x} dx = \frac{\log^2 x}{2} + c$

   f. $\int 3\sec(x) \cdot \tan(x) \cdot \sec^2(x)\, dx = \sec^3 x + c$

   g. $\int 3x^2 e^{x^3} dx = e^{x^3} + c$

   h. $\int e^x \cdot e^x \cdot e^x dx = \frac{e^{3x}}{3} + c$