U-Substitution Problems 2

1. Midterm 1 (Perkins). Compute

$$\int_0^{\pi/4} \sec^2(\theta) \cos\left(\tan(\theta)\right) d\theta$$

2. Midterm 1 (Palmieri). Compute

$$\int \sec^2(2x) \tan^5(2x) \, dx.$$

3. Midterm 1 (Folland). Find the function $F(x)$ such that $F'(x) = x\sqrt{3x+1}$ and $F(0) = 0$.

4. Midterm 1 (Folland). Compute

$$\int_{\pi/6}^{\pi/3} \frac{\sin(3x)}{2+\cos(3x)}\,dx$$

5. Midterm 1 (Burdyz). Compute the integral

$$\int_{-\pi}^{-\pi/2} [\cos x - (\cos x)^2]^2 \sin(x)\, dx.$$

6. Midterm 1 (Perkins). Compute

$$\int_0^\pi \frac{\sin t}{1 + \cos^2 t}\, dt$$

7. Midterm 1 (H. Smith). Evaluate

$$\int \frac{\cos\left(1 + \sqrt{x}\right)}{\sqrt{x}}\, dx$$

8. Midterm 1 (Palmieri). Compute

$$\int_1^2 x(2 - x)^7\, dx.$$