1. The substitution method:
   (a) Write down the chain rule for derivatives: $\frac{d}{dx}f(g(x)) =$
   (b) Label $u = g(x)$. Then, $du = g'(x)dx$. Use this substitution to transform the integral $\int f(g(x))g'(x)dx$ into a simpler form, and explain how to evaluate it.
   (c) Now use this method to evaluate $\int (sin(x))^2 cos(x)dx$.

2. What is $\displaystyle\int \tan t \sec t \, dt$? Suppose you had forgotten that $\tan t \sec t = (\sec t)'$, but you remembered the antiderivatives of the sine and cosine (you do, don't you?). Can you still solve the problem using substitution?

3. Compute the following integrals. In each case, think about whether substitution will be the best approach before you start.
   (a) $\displaystyle\int x(x+1)^2 \, dx$
   (b) $\displaystyle\int \cos x \sqrt{\sin x} \, dx$
   (c) $\displaystyle\int \frac{e^{2x} + e^x}{e^x} \, dx$
   (d) $\displaystyle\int x\sqrt{x+2} \, dx$

4. Compute the following integrals:
   (a) $\int_0^{\pi/4} \sec x \tan^2 x \, dx$
   (b) $\int_1^e \frac{1}{x\sqrt{\ln x}} \, dx$
   (c) $\int_0^{\pi} \frac{\sin x}{\cos^2 x} \, dx$

5. Find formulas for the values of these definite integrals, where a, b, c, d are constants. Do any restrictions apply?
   (a) $\int_a^b (cx+d)^n \, dx$
   (b) $\int_a^b x(cx^2+d)^n \, dx$