Name: _____

Names of collaborators: _____

Main Points:

1. Synthesize and practice what we have learned
2. Use tables or technology to evaluate integrals

At this point, we have learned many techniques of integration: rewrite integrand (using basic algebra, trig identities, or partial fraction decompositions), perform a substitution (simple or trig substitution), use integration by parts. We often use one technique after another. You develop instincts through experience. Now is the time to practice!

Exercises. Evaluate the integrals. State, in words, what techniques you use.

1. $\displaystyle\int \frac{x}{\sqrt{4-x^2}}\,dx$

2. $\displaystyle\int_0^1 \frac{e^{\arctan y}}{1+y^2}\,dy$

3. $\int \theta \sin^2 \theta \, d\theta$

4. $\int x^2(1-x^2)^{-1/2} \, dx$

5. $\displaystyle\int \frac{1}{e^{3x} - e^x}\, dx$

   Hint: Start with the substitution $u = e^x$. Then $du = e^x\, dx$. This implies $dx = (1/u)du$.

6. $\int x \sin^2 x \cos x \, dx$

   Hint: Start with IBP. Let $u = x$ and $dv = \sin^2 \cos x \, dx$.

Using a Table of Integrals or technology can be helpful. The textbook has a Table of Integrals in the Reference Pages. The `Integrate` command in *Mathematica* will evaluate definite and indefinite integrals. (The website WolframAlpha, which uses *Mathematica* in the background, is also a helpful resource.)

Exercises

7. Consider the integral $\int_0^1 \sqrt{x - x^2}\, dx$.

   (a) Use Formula 113 from the Table of Integrals in the Reference Pages of the textbook to evaluate the integral.

   (b) Use technology to evaluate the integral, and check that your answer is the same. In *Mathematica*, the command is `Integrate[Sqrt[x - x^2], {x, 0, 1}]`.

8. (a) Use technology to evaluate $\int e^{-x^2}\, dx$. Is the antiderivative of e^{-x^2} elementary?

   (b) Use technology to evaluate $\int_0^1 e^{-x^2}\, dx$.