

Integration tips and tricks

Math 1A, section 103

April 15, 2014

0. (Warmup.) Find $\int_0^1 x \, dx$.
1. What is $\int_{-3}^3 \sqrt{9 - x^2} \, dx$? (Tip: Sometimes it's **easier to compute an area under a curve** than to find the antiderivative.)
2. Sometimes it helps to **simplify an expression before you integrate it**. Use this principal to evaluate

$$\int_1^5 \frac{x^2 + 5x + 6}{x^2 + 3x} \, dx.$$

3. **Look for familiar derivatives** in other integral problems:

(a) $\int_1^2 \frac{2}{x} \, dx$

(b) $\int_1^2 \frac{3}{1+x^2} \, dx$

(c) $\int_1^2 \cos(\sin(x)) \cdot \cos(x) \, dx$

4. Let's see if you can do this one without any tips. Evaluate

$$\int_0^{\pi/3} \frac{\sin(\theta) + \sin(\theta) \tan(\theta)}{\sec^2(\theta)} \, d\theta.$$

5. **Rejoice in your newfound power of prophecy!** Suppose you throw a ball upward in the air from a starting height of 2 meters and a starting velocity of 3 meters per second. Given that the Earth's gravity causes the ball to have a constant acceleration of $-9.8m/s^2$, how long will it take for the ball to reach the ground?