

# Homework 7

Math 252

Due June 2nd at 11:59 PM

## Textbook Exercises

**3.2:** 69, 70, 73, 75, 79, 81, 85, 85, 87, 97

**3.3:** 127, 134, 137, 138, 139

**3.4:** 183, 185, 189, 195, 199, 209

**3.7:** 347, 349, 351, 357, 359, 367, 371

**4.1 (optional):** 9, 11, 19, 29, 37

**4.2 (optional):** 66, 67, 68, 69, 75, 79

**4.3 (optional):** 119, 125, 129, 135

**Exercise 1:** Evaluate  $\int \frac{\sqrt{x^2 + 9}}{x} dx$ .

Hint: Once you've substituted and simplified, expand  $\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)}$  and  $\sec(\theta) = \frac{1}{\cos(\theta)}$ . Then use  $\sec^2(\theta) = 1 + \tan^2(\theta)$  and split the integral and use  $\int \csc(\theta) d\theta = -\ln(\csc(\theta) + \cot(\theta)) + C$ .

**Exercise 2:** (Optional review problem) A tank contains 1 kg of salt dissolved in 100 liters of water. A salt solution of .1 kg per liter is pumped into the tank at 2 liters per minute, and the well-mixed solution is pumped out of the tank at the same rate. Find  $C(t)$ , the concentration of salt at time  $t$ .

**Bonus:** (Optional review problem) Give an example of a differential equation that isn't separable.