

## Math 2142 Homework 8: Due Friday March 30

**Problem 1.** Use the Taylor series for  $\sin x$  to estimate  $\sin 1/2$  within  $10^{-5}$ .

**Problem 2.** Use the Taylor series for  $e^x$  to estimate  $1/e$  within  $10^{-4}$ .

**Problem 3(a).** Give the Taylor series for  $x \ln(1 + x^2)$ . You can use the Taylor series for  $\ln(1 + x)$  from class.

**3(b).** Estimate the following integral within  $10^{-4}$

$$\int_0^{1/5} x \ln(1 + x^2) dx$$

**Problem 4(a).** Give the Taylor series for  $\arctan(x/2)$ . You can use the Taylor series for  $\arctan x$  from class.

**4(b).** Estimate the following integral within  $10^{-3}$

$$\int_0^1 \arctan(x/2) dx$$

**Problem 5.** In this problem, you will derive the Taylor series for  $\ln x$  centered at 1.

**5(a).** Let  $f(x) = \ln x$ . Find a formula for  $f^{(n)}(x)$  for  $n \geq 1$ . You don't have to use induction to prove your formula is correct.

**5(b).** Use 5(a) to give the formula for  $f^{(n)}(1)$  for  $n \geq 1$ .

**5(c).** Give the formula for the Taylor series for  $\ln x$  centered at 1.