Name: _____

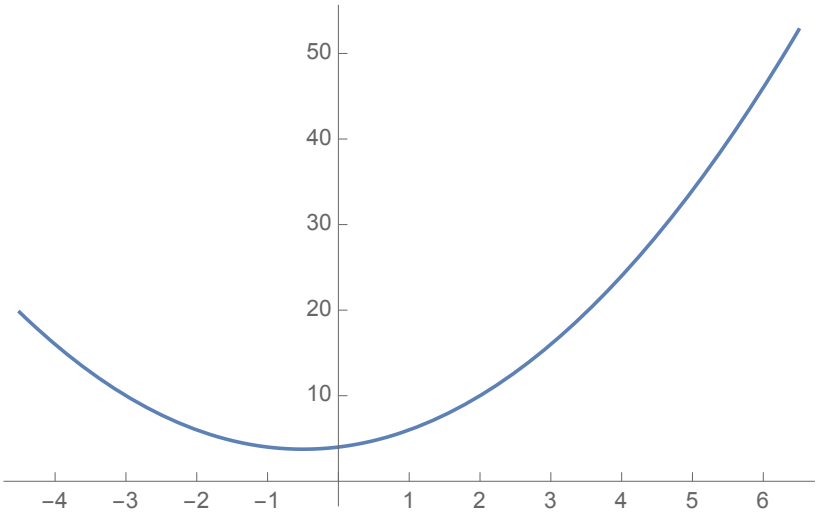
MAC 2312 — Homework 2

Directions: Complete the following problems (front and back) for a homework grade. Problems *must* be neatly written up and presented in a professional manner in order to receive credit, and answers given without showing work will not be eligible to receive partial credit.
Date Due: October 10, 2016.

1. Go to the course's Slack room (see course homepage for the URL) and post something on any one of the channels. You may also create a new channel and comment there.

   Hint: One way to grade this question is to assign points based on whether you said something trivial like *Hey!* or *'sup brah* versus something about what you did last weekend, how your classes are going, etc. Participate accordingly.... ;)

2. (a) Given the graph of the function $f(x) = x^2+x+4$ below, sketch the rectangles corresponding to an M_5 approximation of $I = \int_{-4}^{6} f(x)\,dx$.



   (b) Use M_5, T_5, and S_8 to numerically approximate I.

   (c) Bound the errors of the three approximations found in part (b).

   Hint: You'll need to find f'' and $f^{(4)}$ and find the (approximate) maximum of each on the interval $[-4, 6]$; these values can be used for K_1 and K_2, respectively.

   (d) How many trapezoids must be used to ensure that T_n approximates I within an error of 10^{-16}?

3. (a) For each of the following integrals, determine whether they're type I improper, type II improper, or not improper at all. Then, determine whether the integral converges or diverges, and if it converges, compute its value.

   i. $\displaystyle\int_{-\infty}^{0} e^x \cos x \, dx$

   ii. $\displaystyle\int_{0}^{1} \frac{\ln x}{x^2} \, dx$

   iii. $\displaystyle\int_{\pi/2}^{3\pi/2} \frac{2x+4}{(x^2+1)(x^2+4)} \, dx$

   iv. $\displaystyle\int_{-\infty}^{\infty} \frac{dx}{x^2+c}$ for $c > 0$.

(b) For each of the following integrals, determine whether they're type I improper, type II improper, or not improper at all, and whether they converge or diverge.

   i. $\displaystyle\int_{0}^{\pi} \sec\theta \, d\theta$

   ii. $\displaystyle\int_{1}^{\infty} \frac{\ln x}{x^2} \, dx$

   iii. $\displaystyle\int_{1}^{2} \frac{dx}{x \ln x}$

   iv. $\displaystyle\int_{-3}^{\infty} e^{-x} \arctan^3 x \, dx$