

Directions: Show all work on a separate sheet of paper for full credit.

1. Let  $f(x) = \sin x$ 
  - (a) Find the 4th degree Taylor Polynomial centered at  $a = 0$ . Graph it and  $f(x)$ .
  - (b) Evaluate  $f$  and the polynomial at  $x = 0$ ,  $x = \pi/4$ , and  $x = \pi/2$ .
2. Find the Taylor polynomial  $T_3(x)$  for the function  $f$  centered at the number  $a$ .
  - (a)  $f(x) = \cos(x)$  at  $a = \pi/2$
  - (b)  $f(x) = \tan^{-1}(x)$  at  $a = 1$
  - (c)  $f(x) = e^{-x} \sin x$ ,  $a = 0$
3.
  - (a) Approximate  $f$  by a Taylor Polynomial with degree  $n$  at  $a$ .
  - (b) Use Taylor's Inequality to estimate the accuracy of the approximation  $f(x) \approx T_n(x)$  when  $x$  lies in the given interval.
    - i.  $f(x) = 1/x$ ,  $a = 1$ ,  $n = 2$ ,  $0.7 \leq x \leq 1.3$ .
    - ii.  $f(x) = x \ln x$ ,  $a = 1$ ,  $n = 3$ ,  $0.5 \leq x \leq 1.5$