# 11.11 - Applications of Taylor Polynomials

## 11.11a

**Exercises:**

Find the Taylor polynomial $T_3(x)$ for the function $f$ centered at the number $a$. Graph $f$ and $T_3$ on the same screen.

$f(x) = \sin x,\ a = \dfrac{\pi}{6}$

$f(x) = e^{-x} \sin x,\ a = 0$

## 11.11b

Approximate $f$ by a Taylor polynomial with degree $n$ at the number $a$. (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.
(c) Check your result in part (b) by graphing $|R_n(x)|$.
$f(x) = \sin x,\ a = \dfrac{\pi}{6},\ n = 4,\ 0 \le x \le \dfrac{\pi}{3}$

## 11.11c

Use the information from the previous exercise to estimate $\sin 38^\circ$ correct to five decimal places.

# 11.11d

Approximate $f$ by a Taylor polynomial with degree $n$ at the number $a$.
(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.
(c) Check your result in part (b) by graphing $|R_n(x)|$.
$f(x) = \ln(1 + 2x)$, $a = 1$, $n = 3$, $0.5 \leq x \leq 1.5$

## 11.11e

Use the Alternating Series Estimation Theorem or Taylor's Inequality to estimate the range of values of $x$ for which the given approximation is accurate to within the stated error. Check your answer graphically.

$\cos x \approx x - \frac{x^2}{2} + \frac{x^4}{24}$ ($|\text{error}| < 0.005$)