

## 11.11 - Applications of Taylor Polynomials

## Preparation (Watch at Home)

## 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.

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

[illegible]

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

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

### 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  $|R_n(x)|$ .

$$f(x) = \sin x, a = \frac{\pi}{6}, n = 4, 0 \leq x \leq \frac{\pi}{3}$$



### 11.11c

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

[illegible]

## In-Class Discussion

### 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  $|R_n(x)|$ .

$$f(x) = \ln(1 + 2x), a = 1, n = 3, 0.5 \leq x \leq 1.5$$

[illegible]

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### 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.

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

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## In-Class Practice

1. Find the Taylor polynomial  $T_3(x)$  for the function  $f(x) = x \cos x$  centered at  $a = 0$ . Use Desmos (<https://www.desmos.com/calculator>) to graph  $f$  and  $T_3$  on the same screen.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

a) Approximate  $f$  by a Taylor polynomial of 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 the result in part (b) by graphing  $|R_n(x)|$ .

2.  $f(x) = x^{-1/2}$ ,  $a = 4$ ,  $n = 2$ ,  $3.5 \leq x \leq 4.5$

[illegible]

3.  $f(x) = x \ln x$ ,  $a = 1$ ,  $n = 3$ ,  $0.5 \leq x \leq 1.5$



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