

## 11.11 : Applications of Taylor Series.

Ex 1: We want to approximate  $f(x) = \sin(x)$   
w/  $T_m(x)$  about  $x=0$  (this being the  
 $m^{\text{th}}$  partial sum). Furthermore we want  
our error  $< 10^{-10}$  on  $[-\frac{\pi}{2}, \frac{\pi}{2}]$

$$T_m(x) = \sum_{n=0}^m \frac{(-1)^n x^{2n+1}}{(2n+1)!}$$

$$f(x) = T_m(x) + R_m(x)$$

$$|R_m(x)| \leq \frac{M}{(m+1)!} |x|^{m+1} \leq \frac{1}{(m+1)!} \left(\frac{\pi}{2}\right)^{m+1} \leq 10^{-10}$$

w/ the A.S.T. the next term out is  
an upper bound on the error.

To decrease the number of necessary terms,  
we can consider where in the interval  
 $(x_{\text{min}}, x_{\text{max}})$   $x$  is prior to determining  
the number of terms needed.

Ex 2: Where is this done? The pendulum in physics.

Ex 3: Find an approx for  $f(x) = \sin(x)$  about  $x = \frac{\pi}{2}$

Ex 4: Find an approx for  $\tan(x)$  at  $a=0$  w/  $n=4$   
• graph the result.  
• estimate the error on  $[0, \pi/6]$

Before the calculator.  
see mathematics notebook.

NATURAL TRIGONOMETRIC FUNCTIONS TO FIVE PLACES

Table with columns: Sin, Cos, Tan, Cot, Sec, Csc, and rows for angles from 0 to 90 degrees. Includes sub-tables for 119° and 120°.

NATURAL TRIGONOMETRIC FUNCTIONS TO FIVE PLACES

Values of the trigonometric functions sin, cos, tan, cot of angle for each minute from 0-360°. For degrees indicated at the top of the page use the column headings at the top. For degrees indicated at the bottom use the column indications at the bottom. With degrees at the left of each block (top or bottom), use the minute column at the left and with degrees at the right of each block use the minute column at the right. If unusual trigonometric functions tables are used for angle measures greater than 90° and less than 270°, appropriate signs for the functions must be supplied in accordance with the quadrant in which the angle measure belongs. Linear interpolation may be used to obtain values of the functions for seconds or other fractions of a minute, except in regions where the functions are rapidly changing. See section on "Use of Logarithm Tables" for further discussion in interpolation practice.