Derivatives of Trigonometric Functions

DerivativeTrig.tns

Name ______________________

Class ______________________

Problem 1 – Finding the derivative of the sine function

Advance to page 1.4. A series of 11 open circles are on the x-axis as well as a tangent drawn to the graph of $y = \sin x$. The slope of the tangent is shown at the top right of the screen.

Your goal is to move the tangent line such that the point of tangency is located directly above each of the 13 points, starting with the leftmost point.

The next step is to move the corresponding point on the x-axis vertically so that it's y-coordinate is approximately equal to the slope of the tangent. Continue alternately moving the tangent line and then the corresponding point on the x-axis until all 13 points have been moved.

Inspect the resulting scatter plot, which represents the approximate graph of the derivative of the sine function.

- What function do you think is represented by this scatter plot?

To confirm your conjecture, press ctrl + G to show the entry line and enter your guess for the derivative of the sine in ***f2***(x).

Advance to page 1.6. Confirm your function by setting up and evaluating a limit expression, based on the definition of the derivative. Use the **Limit** command from the Calculus menu.

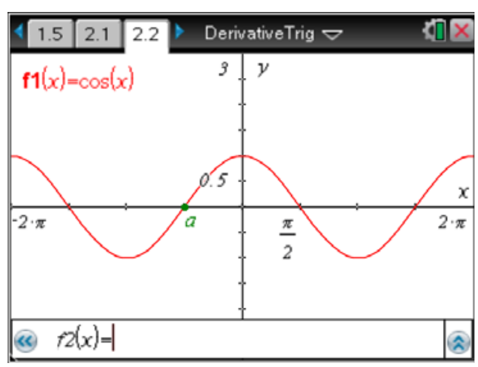
- What is the limit expression and the value of the limit?

Next, use the **derivative** command as a final check of your result.

- What is the derivative of $y = \sin x$?

Problem 2 – Finding the derivative of the cosine function

The cosine function can be thought of as a translation of the sine function. Advance to Page 2.2, which shows a graph of ***f*1**(x) = cos(x).



Point *a* indicates the beginning of one cycle of the sine graph. Using this as your starting point, as well as what you know about the derivative of the sine function, sketch (on the diagram at right) what you think will be the graph of the derivative of the cosine.

- Inspect your graph and write the derivative of the cosine in terms of the sine.

Confirm your result by graphing the derivative of the cosine as ***f*2**(*x*). Express ***f*2**(*x*) strictly in terms of the sine function.

On page 2.3, set up and evaluate a limit for the derivative of the cosine. Confirm your answer by using the **derivative** command.

Problem 3 – Finding the derivative of the tangent function

To find the derivative of the tangent function, write the tangent in terms of the sine and cosine.

- Use the quotient rule to find the derivative of this expression.

Simplify the result and check your answer on page 3.2 by using the **derivative** command to find the derivative of the tan(*x*).

The derivative of the tangent is usually written in terms of the reciprocal trigonometric functions, cosecant, secant, or cotangent.

- Write the derivative of the tangent in terms of one of these reciprocal functions.