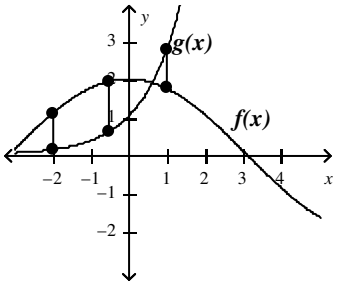
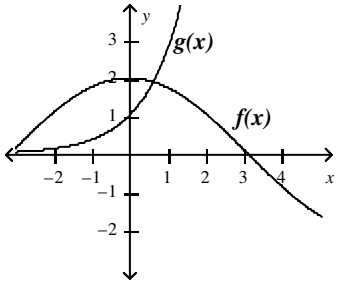
Name _____ Period _____ Date _____

Assignment #3A: *Recap and a New Operator…*

1. Find the lengths of each of the vertical lines below. In the graph, $f(x)=2\cos\left(\frac{x}{2}\right)$ and $g(x)=e^x$. The vertical lines are at $x=-2$, $x=-0.5$, and $x=1$.



2. Let *R* be the region bounded by $f(x)=2\cos\left(\frac{x}{2}\right)$, $g(x)=e^x$, the *x*-axis, and the *y*-axis. Find the area of *R*.



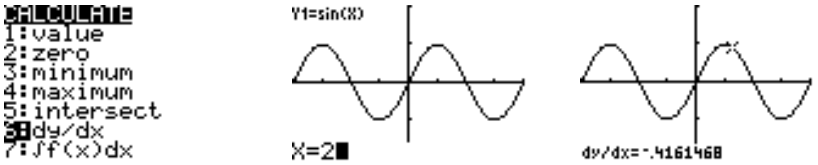
3. Find the average value of the function $f(x)=2\cos\left(\frac{x}{2}\right)$ on the interval $[-\pi,\pi]$.

4. Find the average value of the function $f(x)=2\cos\left(\frac{x}{2}\right)$ on the interval $[-2,2]$.

Name _____ Period _____ Date _____

In our first unit, *Calculus as a Black Box*, we saw that the definite integral was a function that could give us the area of a function in a certain range. A second major operator in Calculus is the **derivative**. We'll use our black boxes to give us the derivative of certain functions at given values. Your job is to look for a pattern that describes what the derivative means.

The numeric derivative can be found in the 2nd Calc menu. To find the derivative of $y = \sin x$ at $x = 2$, one can graph the function, select 2nd Calc | $\frac{dy}{dx}$, type in $x = 2$, then hit enter.



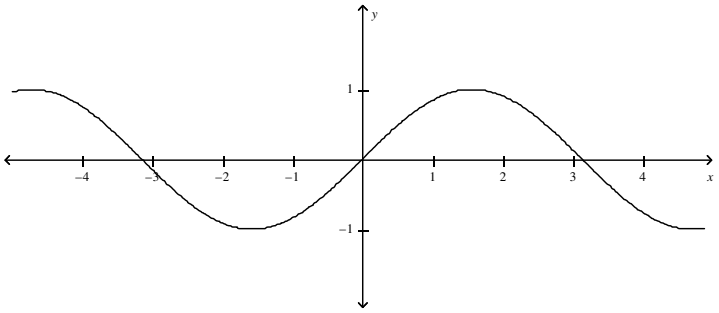
The derivative of $y = \sin x$ at $x = 2$ is approximately $-.4161$. Or using proper notation,

$\frac{d}{dx}(\sin x)\big|_{x=2} \approx -.4161$.

Use your calculator to find the derivatives of the functions below. At each given *x*-coordinate, draw a dot and label it with the value of the derivative at that point.

What do you notice? When is the derivative positive? Negative? Zero? What if the derivative is a *big* number? What if it's a *small* number?

5. For $y = \sin x$, label the derivative values at $x = -3, -\frac{\pi}{2}, 0, \frac{\pi}{2}, 3, \frac{3\pi}{2}$.



6. For $y = x^2$, label the derivative values at $x = -3, -2, -1, 0, 1, 2, 3$.

7. For $y = -x$, label the derivative values at $x = -3, -2, -1, 0, 1, 2, 3$.

8. For $y = 3x$, label the derivative values at $x = -3, -2, -1, 0, 1, 2, 3$.

9. For $y = -2$, label the derivative values at $x = -3, -2, -1, 0, 1, 2, 3$.

10. For $y = e^x$, label the derivative values at $x = -2, -1.5, -1, 0, 1, 1.5, 2$.
    By the way, check the *y*-coordinates at each value for this graph while you're at it…