

Math 112
Review for Exam I

This test is all about derivatives!

- $f'(m)$ is the slope of the tangent line to $f(x)$ at $x = m$
- The derivative of distance is the instantaneous speed. That is, instantaneous speed is the slope of a tangent line to the graph of distance.
- The derivative of TR is MR . That is, you can think of MR as the slope of a tangent line to the graph of TR .
- The derivative of TC is MC .

We have two methods for computing derivatives. You must be able to do both!

- the long way:

To compute $f'(m)$, compute the slope of the secant line through $f(x)$ at $x = m$ and $x = m+h$.

$$\text{slope of secant} = \frac{f(m+h) - f(m)}{h}.$$

Simplify this expression and let h go to 0 to get the slope of the tangent line, $f'(m)$.

- using the derivative rules (This should be your default method — do this unless you're told otherwise.)

Given the graph of $f(x)$, you should be able to determine the general shape of $f'(x)$:

- If $f(x)$ is increasing, then $f'(x)$ is positive (the graph of $f'(x)$ is above the x -axis).
- If $f(x)$ is decreasing, then $f'(x)$ is negative (the graph of $f'(x)$ is below the x -axis).
- If $f(x)$ has a horizontal tangent, then $f'(x) = 0$ (the graph of $f'(x)$ is hitting the x -axis).

Given the graph of $f'(x)$, you should be able to determine the general shape of $f(x)$:

- If $f'(x)$ is positive, then $f(x)$ is increasing.
- If $f'(x)$ is negative, then $f(x)$ is decreasing.
- If $f'(x) = 0$, then $f(x)$ has a horizontal tangent line at x .

Rules for exponents:

- $x^a x^b = x^{a+b}$
- $\frac{x^a}{x^b} = x^{a-b}$
- $x^{-a} = \frac{1}{x^a}$; $\frac{1}{x^{-a}} = x^a$
- $x^{a/b} = \sqrt[b]{x^a}$
- $(x^a)^b = x^{ab}$
- $x^0 = 1$
- $x^1 = x$