

Math 170 Calculus I

Exam II Review ◦ Exam II: Wednesday, October 17, 2018

Exam II will be based on material from Sections 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 3.2.

You will be expected to know:

- how to find the tangent line to a function at a point
- the relationship between the tangent line of a function and the derivative
- how to find the derivative of a function using the limit definition (you will need to know the definition - it will not be provided)
- how to decide if a derivative of a function exists based on its graph
- the notations used to describe derivatives
- basic algebraic properties of the derivative from section 2.3
- the power rule: $\frac{d}{dx}[x^n] = nx^{n-1}$
- how to find the higher derivatives of a function and the related notation
- the product rule: $\frac{d}{dx}[f(x)g(x)] = f'(x)g(x) + f(x)g'(x)$
- the quotient rule: $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2}$
- the derivatives of the six trigonometric functions
- the chain rule: $\frac{d}{dx}[f(g(x))] = f'(g(x))g'(x)$
- how to find y' and y'' when y is implicitly defined
- the derivatives of logarithmic functions and compositions involving them
- how to find the derivative of a function using logarithmic differentiation

Some sample problems:

- Find all values of x where the tangent line to $f(x) = x^3 - 27x + 18$ is horizontal.
- Find a point on the graph of $y = x^2$ where the tangent line to y is parallel to the line $y = 6x - 4$.
- Find $f'(x)$ using the limit definition of the derivative when $f(x) = 3x^2 - 1$. Check your answer using the power rule.
- Find $f'(x)$ using the limit definition of the derivative.
(a) $f(x) = \frac{1}{x^2}$ (b) $f(x) = \sqrt{2x+1}$ (c) $f(x) = x^3 - 4x$
- Find $\frac{d^2y}{dx^2}$ if $y = 6x^4 - 9x^2 + 10x - 3$
- Find $f'(x)$ using the power rule only:
(a) $f(x) = \frac{1}{3}(x^6 - 2x^3 + 5)$ (b) $f(x) = 4x^{-2} - 3\sqrt{x}$ (c) $f(x) = \frac{4x^5 - 8x^2 + 9}{x^2}$
- Find $f'(x)$ if $f(x) = \sqrt{2x+1}(5x+2)$
- Find $f'(x)$ if $f(x) = \frac{1 + 4x^3 - 8x^5 + x^7}{x^2}$
- Find $f'(x)$ if $f(x) = x^6 - 4\sqrt{x} + \frac{1}{4x^3}$
- Find $f'(x)$ if $f(x) = \pi^e - e^\pi + \ln(1)$
- Find $f'(x)$ if $f(x) = \frac{-2x^3 - 5x}{8x^2 - 10x}$
- Find $f'(x)$ if $f(x) = \sin(x^3 + 2)$
- Find $f'(x)$ if $f(x) = \left(\frac{x^2 - 2}{2x^2 + 1}\right)^3$
- Find $f'(x)$ if $f(x) = \left(\frac{\sin(x)}{\cos(x)}\right)^4$
- Find y' :
(a) $x^2 + y^2 = 5$
(b) $3xy^2 + 6y - 4x^3 = 10$
(c) $\tan(xy) = y$
- Find y'' if $x^2 + y^2 = 50$. Simplify your answer as much as possible.
- Find $f'(x)$, using any method you prefer:
(a) $f(x) = \ln(x^3 + 4x^2 - 3x + 5)$
(b) $f(x) = \sqrt{\ln(2x^3)}$
- Find y' using logarithmic differentiation if
(a) $y = \left(\frac{x^2 - 5}{3x^4 + 6}\right)(x^3 + 1)(3x^4 - 5x^2 + 2x)$ (b) $y = \left(\frac{\sqrt{x}(x^2 - 3)}{\sqrt[3]{5x^3 - 4x + 1}}\right)^4$