

EXAM 2 - MATH 151

DATE: Tuesday, February 20

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Read each problem very carefully before starting to solve it. Each question is worth 5 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

- Give the definition of the derivative $f'(a)$ of a function $y = f(x)$ at the point $x = a$. (1 point)
 - Use the **limit definition** of the derivative to compute the derivative $f'(a)$ if $f(x) = \frac{x^2+1}{x-2}$. (4 points)
- Find an equation of the tangent line to the curve $y = (1+x)\cos x$ at $x = 0$. (2 points)
 - Find $f''(1)$ if $f(x) = \frac{x^2}{1+x}$. (3 points)
- Compute the derivatives of the following functions:
 - $f(x) = \sec^2 x + \tan^2 x$ (2 point)
 - $f(x) = \sqrt{\cos(\sin^2 x)}$ (3 points)
- Find an equation of the tangent line to the graph of $y = (1+2x)^{10}$ at $x = 0$. (3 points)
 - If $h(x) = \sqrt{4+3f(x)}$, where $f(1) = 7$ and $f'(1) = 4$, find $h'(1)$. (2 points)
- Find $\frac{dy}{dx}$ if $x^2y^2 + x \sin y = 4$. (2 points)
 - Find an equation of the tangent line to the curve $y^2(y^2 - 4) = x^2(x^2 - 5)$ at the point $(0, -2)$. (3 points)
- A lighthouse is located on a small island 3 km away from the nearest point P on a straight shoreline and its light makes four revolutions per minute. How fast is the beam of the light moving along the shoreline when it is 1 km from P ?
 - Set your variables and find an equation that relates the variables that you chose. (2 points)
 - Differentiate the equation to solve the problem. (3 points)