

Midterm Examination 2 - Math 141, Frank Thorne (thornef@mailbox.sc.edu)

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Please work without books, notes, calculators, or any assistance from others. If you have any questions, feel free to ask me.

- (1) Draw a graph of a function which is not differentiable, and geometrically explain why it is not differentiable.

Note: By “not differentiable” I mean that there is at least one point at which the function is not differentiable.

- (2) If $g(t) = \frac{1}{\sqrt{t}}$, find $g'(t)$ using the definition of the derivative.
- (3) Find the 500th derivative of $f(x) = x^{100}$. Explain your answer.
- (4) Find $\frac{dh}{d\theta}$ if $h(\theta) = \csc(\theta) + e^\theta \cot(\theta)$.
- (5) The cardioid $x^2 + y^2 = (2x^2 + 2y^2 - x)^2$ is graphed. Use implicit differentiation to find the equation of the tangent line to the curve at the point $(0, 1/2)$.
- (6) A streetlight is mounted at the top of a 15 ft tall pole. A woman 6 ft tall walks away from the pole with a speed of 5 ft/s along a straight path. How fast is the tip of her shadow moving when she is 40 ft from the pole?
- (7) Find the derivative of $f(x) = \ln(1 + 2x)$.
- (8) Sketch the graph of $f(x) = 1 - \sqrt{x}$, and find the absolute and local maxima and minima of f .