

Math 1001
Test 2

Name:
GSA:

50 min. No books, no notes, no electronic devices. You must show your work to receive credit.

1.[7] For $f(x) = \tan^{-1}(3^x) + \sin^{-1}(\sqrt{x})$, differentiate term-by-term to find $f'(x)$, simplifying where possible.

2.[8] A function $y = y(x)$ is given implicitly by the equation $\ln y = e^x - e^y$. Find $y' = \frac{dy}{dx}$.

3.[8] For $f(x) = (x-1)^x$, use logarithmic differentiation to find $f'(x)$. *Your final answer should have no $f(x)'$ term.*

4.[9] Let $x(t), y(t)$ be differentiable functions of t . If $R = \sqrt{x^2 + y^2}$, $\frac{dx}{dt} = 8$, $\frac{dy}{dt} = 1$, what's $\frac{dR}{dt}$ when $x = 3$ and $y = -4$?

5.[12] Find the absolute maximum value and absolute minimum value of $f(x) = 6x^2 - x^3$ on $[-1, 1]$.

6.[16] For the function $f(x) = x^3 - 6x^2 + 9x$

(a) Find the critical points of f .

(b) Play the \pm *sign game* to find the open intervals on which f is increasing and the open intervals on which f is decreasing. Your final answer should be expressed in interval notation.

(c) Use the 1st derivative test to identify all local extrema for the graph of f . Be clear how you're using the test.