

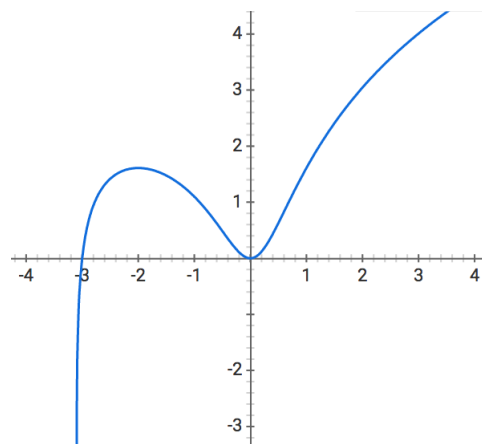
MATH 105 EXAM #2

First, put your name on each page. Show all your work for partial credit. Please circle your answers. Good luck.

1. (a) T or F. If $f(x)$ has no critical points, then $f(x)$ has no local extrema.
(b) T or F. If $f(x)$ has no critical points, then $f(x)$ has no global extrema.
(c) T or F. It is possible that $f'''(-3) < 0$ and $x = -3$ is a local minimum.
(d) T or F. $f''(1)$ represents the slope of the tangent line at $x = 1$.
2. Draw a function with exactly one inflection point. Mark all sections of the graph that are concave down.
3. If $f''(x) < 0$ for $x > 5$ and $f''(x) > 0$ for $x < 5$, can you conclude anything about $x = 5$?
4. Is it possible for $f'(a) = 0$ and $f''(a) = 0$ at some x -value of a ? Why or why not? What does this mean?
5. We learned how to take the derivative of an exponential function of base e . But $f(x) = 3^{x^2-x}$ is also an exponential function, just of base 3. Use the following new differentiation rule to compute $f'(x)$.

If $f(x) = a^{\text{power}}$, then $f'(x) = (\ln(a))(a^{\text{power}})(\text{power}')$.

6. Find the equation of the tangent line for $f(x) = \ln(x^3 + 3x^2 + 1)$ at $x = -1$. Draw the tangent line on the graph.



7. Use either the 1st or 2nd Derivative test to find the x -values at which local extrema for $f(x) = e^x x^2$ occur.
8. Find the x -values at which absolute extrema of $f(x) = 2x^3 + 3x^2 - 12x - 7$ occur on the interval $0 \leq x \leq 3$.
9. Find the inflection points and intervals of concave up and concave down for $f(x) = \frac{1}{4}x^4 - \frac{2}{3}x^3 + \frac{1}{2}x^2 - 2x$.