

HOMEWORK 12
APPLIED CALCULUS
DUE 2013-10-08

Show your work!

- (1) Consider the function $f(x) = \ln(x^2 + 1)$.
 - (a) Compute the first derivative $f'(x)$, and make a sign diagram for it.
 - (b) Compute the second derivative $f''(x)$, and make a sign diagram for it.
 - (c) Use your sign diagrams from (a) and (b), and the fact that the only x -intercept of $y = f(x)$ is at $x = 0$, to sketch a picture of the graph of $y = f(x)$.

 - (2) Consider the function $g(x) = \frac{x^2}{x+1}$.
 - (a) Compute the first derivative $g'(x)$, and make a sign diagram for it.
 - (b) Compute the second derivative $g''(x)$, and make a sign diagram for it.
 - (c) Use your sign diagrams from (a) and (b), and the facts that the only x -intercept of $y = g(x)$ is at $x = 0$ and the only vertical asymptote is at $x = -1$, to sketch a picture of the graph of $g(x)$.

 - (3)
 - (a) What is the critical number of $y = (x + 1)^4$?
 - (b) Explain why the second-derivative test cannot be used to identify whether the answer to (a) is a local maximum or minimum.
 - (c) Use the first-derivative test to identify whether the answer to (a) is a local maximum or minimum.
 - (d) What changes if you solve the whole problem again, this time with $y = (x + 1)^5$?
- **Eight** book problems: #12.2.38, 40, 42, 47, 49; #12.3.2, 5, 6.