

Assignment 4

Due March 11, 2016

In problems 1 & 2 make sure to identify the horizontal and vertical asymptotes of the function (if any), the intervals where the function $f(x)$ is increasing and decreasing and where it is concave up and concave down. For these problems you will be marked based on both your work and your final graph.

Problem 1.

Sketch the graph of the function

$$f(x) = \frac{e^x}{1 + e^x + e^{2x}}.$$

Hint: To solve an equation of the form $ae^{2x} + be^x + c = 0$, use the substitution $u = e^x$.

Problem 2.

Sketch the graph of the function

$$f(x) = |x^3 - 3x^2 - 5x + 14|.$$

Remember that the first and second derivatives of f can change sign at places where f is not differentiable.

Problem 3.

Suppose that you're in the middle of a curve-sketching problem, and you discover the following information about a function $f(x)$.

- $f(x)$ is defined on $(-\infty, \infty)$. Furthermore, $f(x)$ is twice differentiable on $(-\infty, \infty)$ (That is, f and f' are differentiable everywhere on $(-\infty, \infty)$).
- $f(x)$ has its only critical points at $x = -1$ and $x = 3$.
- $f(-5) = 0$.
- $f(0) = -2$.
- $f(1) = 0$.
- $f(x)$ has its only inflection point at $x = 7$.

Explain how you know that you must have made a mistake. Change one of the bulleted pieces of information about this function to make the information consistent.