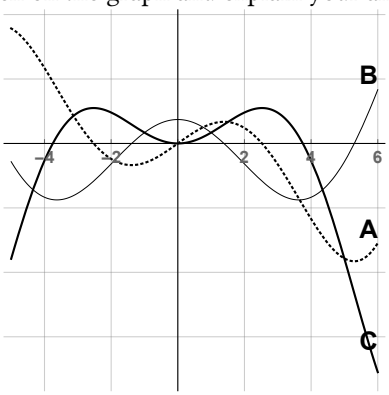
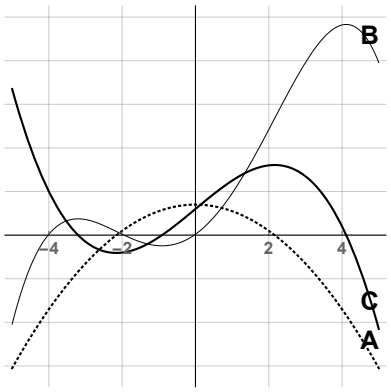
Some Sample Problems for Exam 2

These are only a *few* sample problems to *help* you prepare for the exam. You should also be certain that you completely understand the WeBWorK assignments, Problems Sets, Reading Assignments, in-class work, and your notes.

1. The graphs of f, f', and f'' are shown below on the same set of axes.
   Label each on the graph and explain your answers.





2. Suppose that the graph labeled C on the left graph in #1 is the graph of $g'(x)$.
   (a) Is g concave up or concave down at $x = -2$?
   (b) Find all critical points of g and label them as local maxima, local minima, or neither.
   (c) Suppose $g(-1) = 3$. Could $g(1) = 2$? Could $g(1) = 5$?

3. Suppose that the graph labeled B on the right graph in #1 is the graph of $h''(x)$.
   (a) What are the inflection points of h?
   (b) If the critical points of h are $x = -3$, $x = -1$, and $x = 2$, use the Second Derivative Test to classify each as a local maxima or local minima, if possible.

4. Let $f(x) = e^x$.
   (a) Find the linear approximation of $f(x)$ at $x_0 = 0$ and use this to approximate e.
   (b) Find the third degree Maclaurin polynomial of $f(x)$ and use this to approximate e.
   (c) Which approximation do you think will be more accurate? Why?

5. Let $f(x) = 3\,x^5 - 25\,x^3 + 7$
   (a) Find all critical points of f and classify them as local maxima, local minima, or neither.
   (b) On which intervals is f increasing? Decreasing?
   (c) Find the inflection points of f.
   (d) On which intervals is f concave up? Concave down?

6. Verify that $F(x) = e^x x - e^x + 3$ is an antiderivative of $f(x) = xe^x$.
   What important fact does the Mean Value Theorem tell us about all other antiderivatives of f?

7. You will, of course, want to be fluent in finding derivatives, and I would encourage you to pay special attention to the assigned Problem Set exercises on optimization.