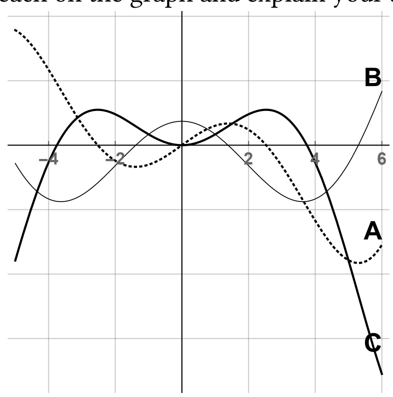
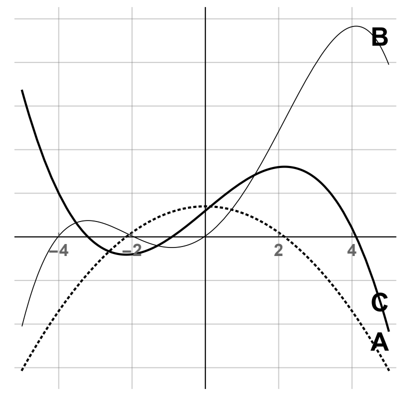
Some Sample Problems for Exam 2

These are only a few *additional* 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 class notes.

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

2. 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.





3. Suppose that the graph labeled C on the left graph in #2 is the graph of $g'(x)$.
   (a) Is g concave up or concave down at $x = -1$?
   (b) Find all critical points of g and label them as local maxima, local minima, or neither.
   (c) Suppose $g(-2) = 5$. Could $g(1) = 0$? Could $g(1) = 10$?

4. Suppose that the graph labeled B on the right graph in #2 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.

5. Evaluate the following limits. Be sure to explain your answers.

$$\text{(a)} \lim_{x\to\infty} x^2\, e^{-3x} \qquad \text{(b)} \lim_{x\to\infty} \frac{\ln(x)}{\cos(3x)+5}$$

6. 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?
   (e) Use this information to sketch a graph of $y = f(x)$.

7. 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 any other antiderivative of f?

8. Why do we use radians to measure angles in calculus rather than degrees?

9. Reminder: You will, of course, want to be fluent in finding derivatives.