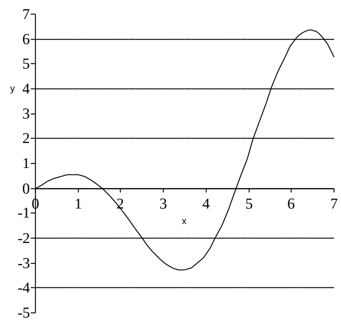
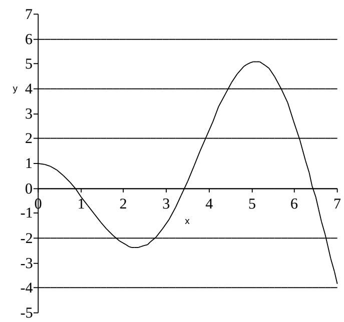
These are only a <u>*few*</u> sample problems to *help* you prepare for the exam. You should also be certain that you completely understand the WeBWorK assignments, Problems Sets, in-class work, and your class notes.

1. You will certainly want to review all of the antidifferentiation problems from the homework and in-class work.

2. The graphs of f' and f'' are shown below.



Plot of $f'(x)$



Plot of $f''(x)$

   (a) Let $I = \int_2^6 f(t)\, dt$. Compute an upper bound on the error $|I - M_{42}|$.

   (b) Let $I = \int_1^4 f(t)\, dt$. Find the smallest value of n such that $|I - T_n| \leq 0.005$. Do the same for M_n.

   (c) Let $I = \int_5^6 f(t)\, dt$. Will L_n overestimate or underestimate I? How about R_n, M_n, T_n? Explain.

3. Carefully explain why $\frac{d}{dx}(\arctan(x)) = \frac{1}{1+x^2}$. (*Hint: See class notes from Jan 30.*)

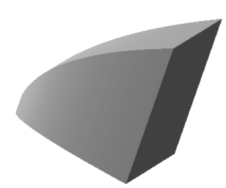
4. Sketch the region bounded by the graphs $y = \sqrt{8x}$ and $y = x^2$. Find the volume of the solid formed when the region is rotated about

   (a) The x-axis

   (b) The horizontal line $y = 5$

5. Show that the improper integral $\int_1^\infty e^{-x^3} x^5\, dx$ converges and find its exact value.

6. The base of a certain solid is the region in the xy-plane bounded to the left by the parabola $x = 9y^2$ and to the right by the line $x = 18$. The cross sections perpendicular to the x axis are squares. Find the volume of the solid.



7. Explain why the integral is improper and determine whether the integral converges or diverges. You do not need to find the values of the convergent integrals.

   (a) $\displaystyle\int_2^\infty \frac{x}{x^2 - 2}\,dx$

   (b) $\displaystyle\int_0^\infty \frac{1}{x^4 + \sqrt[3]{x}}\,dx$

8. (a) Give an example of a function $f(x)$ where
   - $f(x)$ converges to zero as $x \to \infty$,
   - the region R determined by $y = f(x)$, the x-axis, and the line $x = 1$ over the interval $[1, \infty)$ has infinite area,
   - but the solid formed when R is rotated about the x-axis has finite volume.

   (b) Give an example of a function $f(x)$ where
   - $f(x)$ converges to zero as $x \to \infty$,
   - the region R determined by $y = f(x)$, the x-axis, and the line $x = 1$ over the interval $[1, \infty)$ has infinite area,
   - and the solid formed when R is rotated about the x-axis has infinite volume.