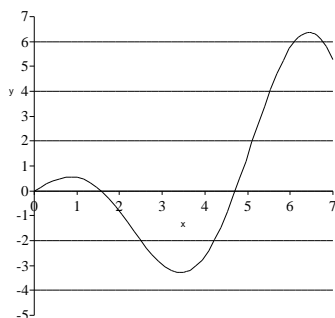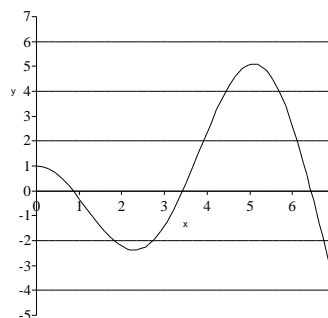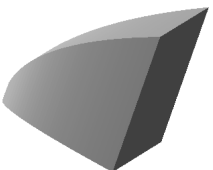These are only a *few* sample problems to *help* you prepare for the exam. You should also be certain that you completely understand the WebWork assignments, Problems Sets, in-class work, and your class notes.

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

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

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

3. Carefully explain why $\dfrac{d}{dx}(\arctan(x)) = \dfrac{1}{1+x^2}$.

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 $\displaystyle\int_1^\infty e^{-x}x\, dx$ converges and find its exact value.

6. The base of a certain solid is the area 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. Do the following integrals converge or diverge? You do not need to find the values of the convergent integrals.

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

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