Some Sample Problems for Exam 3

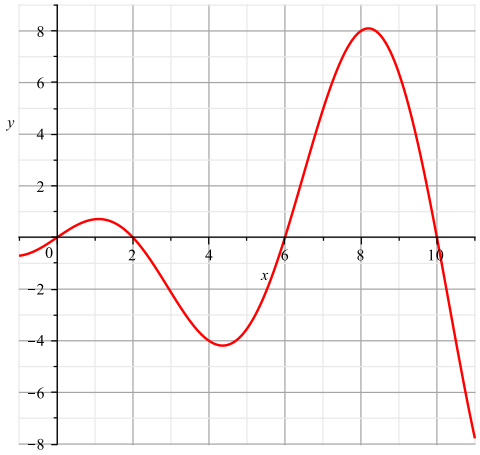
These are only a *few* sample problems to *help* you prepare for the exam. You should also be certain that you completely understand the WeBWorK assignments, Problems Sets, Reading Assignments, in-class work, and your class notes.

1. Use a linear approximation of $f(x) = \ln(x)$ at $x_0 = 1$ to approximate $\ln(1.05)$.

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

3. If $F(x) = \displaystyle\int_0^x 2t\cos(t^2)\,dt$, find the equation of the tangent line to $y = F(x)$ at $x = 1$.

4. The graph of $y = f(t)$ is shown below. Let $F(x) = \displaystyle\int_1^x f(t)\,dt$.
   (a) Use a left sum with four subdivisions to approximate $F(9)$.
   (b) Is $F(2)$ positive or negative?
   Is $F(6)$ positive or negative
   Is $F(0)$ positive or negative?
   (c) Where is F increasing? decreasing?
   (d) Identify all local maxima and minima of F.
   (e) Where is F concave up? concave down?
   (f) Which of your answers would change if $F(x) = \displaystyle\int_5^x f(t)\,dt$? Why?



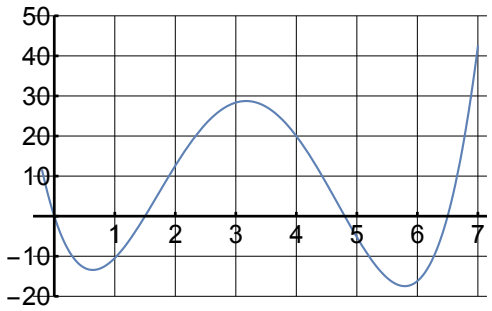
Graph of y= f (t)

5. A ball is thrown straight up with an initial velocity of 20 m/sec from the edge of a roof that is 18 meters above ground level.
   (a) How high will the ball go?
   (b) How long is the ball in the air before it hits the ground?

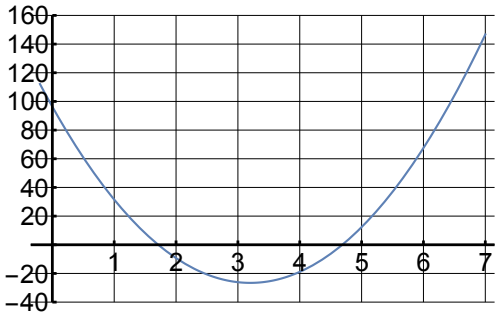
6. Approximate the integral $\displaystyle\int_0^1 \cos(x^3)\,dx$ using a Maclaurin polynomial.
   Hint: Remember that you can use the Maclaurin polynomial for $\cos(x)$ *to find the Maclaurin polynomial for* $\cos(x^3)$

7. What is the difference between a definite integral and an indefinite integral?

8. The graphs of f'' and $f^{(4)}$ are shown below.



Plot of $y = f''(x)$



Plot of $y = f^{(4)}(x)$

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

(b) Let $I = \int_2^5 f(t)\,dt$. Find the smallest value of n such that $|I - S_n| \leq 0.005$.

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