Calculus 1
Spring 2003
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Sample Calculus 1 Final

The following questions are taken from a previous semester's Calculus 1 final. If you have no trouble with these problems, then you're unlikely to learn much from this class and should move on to Calculus 2. Feel free to talk to me if you're unsure which class you should be taking.

1. Evaluate
$$\int_{\sqrt{\frac{\pi}{2}}}^{\sqrt{\pi}} \theta \cos(\theta^2) d\theta.$$

2. Differentiate:
   a) $y = x(\ln x - 1)$
   b) $y = x^x$

3. Consider the function
$$f(x) = e^{-\frac{1}{x+1}}.$$
   a) Find the horizontal and vertical asymptotes.
   b) Find the intervals of decrease and increase.
   c) Find the local maximum and minimum values.
   d) Find the intervals of concavity and inflection points.
   e) Use the information from parts a)-d) to sketch the curve.

4. Consider
$$\frac{y}{x-y} = x^2 + 1.$$
   a) Find $\frac{dy}{dx}$ by implicit differentiation.
   b) Find an equation for the tangent line through the point $(1, 2/3)$.

5. Find the derivative of the function
$$f(x) = \int_1^{x^3} \sqrt{t} \cdot \sin(t)\ dt.$$