Calculus 1A
September 24, 2004
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Common Errors on Week 3 Homework

1. On IVT type problems, many failed to identify the essential aspects for presenting a solution to this type of problem.
   (a) If asked to show an *equation* has a solution, you are not expected to *find* the solution, but rather to prove the *existence* of a solution.
   (b) Define a new function $f(x)$, usually the difference between the right and left hand sides of the equation.
   (c) Determine the appropriate interval $[a, b]$ on which a solution is sought. If no interval is provided in the statement of the problem, then coming up with an appropriate interval becomes an additional task.
   (d) Explain that finding a solution to the original equation for $x \in [0, 1]$ is equivalent to finding a root of the equation $f(x) = 0$
   (e) Calculate $f(a)$, and note if this is < 0 or > 0
   (f) Calculate $f(b)$, and note if this is < 0 or > 0
   (g) Assert that $f(x)$ is a continuous function on the interval $[a, b]$ (one-sided continuous at the endpoints)
   (h) State that by applying the IVT we can conclude that $f(x)$ assumes all values between $f(a)$ and $f(b)$ (or between $f(b)$ and $f(a)$) for $x \in [a, b]$; in particular, there exists an $x \in [a, b]$ for which $f(x) = 0$.
2. (§2.6,#52) The graphs of x^n for $n < 0$ were incorrect. Review pages 30-32 (Figure 14 for $n = -1$).
3. Instead of computing limits, derivatives were computed by applying differentiation rules (which are not covered until chapter 3!)
4. (§2.8,#23) No work was shown explaining that

$$\lim_{h \to 0} \frac{\cos(\pi + h) + 1}{h}$$

   is equivalent to

$$\lim_{h \to 0} \frac{f(a + h) - f(a)}{h}$$

   where

$$f(x) = \cos(x) \text{ and } a = \pi$$

   One should explain that $\cos(\pi) = (-1)$ and that $f(a + h) - f(a)$ becomes $\cos(\pi + h) - \cos(\pi) = \cos(\pi + h) + 1$.