Math 180: Calculus I **Fall 2014**

November 11

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1. Evaluate the following limits
   (a) $\lim_{x\to e} \frac{\ln x - 1}{x-e}$
   (b) $\lim_{u\to \pi/4} \frac{\tan u - \cot u}{u - \pi/4}$
   (c) $\lim_{x\to\infty} \frac{3x^4 - x^2}{6x^4+12}$
   (d) $\lim_{x\to\pi/2} \frac{2\tan x}{\sec^2 x}$
   (e) $\lim_{x\to 0} x \csc x$
   (f) $\lim_{x\to\infty} x - \sqrt{x^2-1}$
   (g) $\lim_{x\to 0^+} x^{2x}$
   (h) $\lim_{x\to 0}(1+4x)^{3/x}$
   (i) $\lim_{\theta\to\pi/2^-}(\tan\theta)^{\cos\theta}$
2. Compare the growth rates of the following functions
   (a) $x^{10}; e^{0.01x}$
   (b) $\ln\sqrt{x}; \ln^2 x$
3. Evaluate this limit, which appeared in L'Hôpital's book.
$$\lim_{x\to a} \frac{\sqrt{2a^3x - x^4} - a\sqrt[3]{a^2x}}{a - \sqrt[4]{ax^3}}$$
4. Consider the following limit
$$\lim_{x\to\infty} \frac{\sqrt{ax+b}}{\sqrt{cx+d}}$$
   where a, b, c, d are all positive real numbers. What happens when L'Hôpital's rule is used? How else can the limit be found?
5. Find all antiderivatives
   (a) $g(x) = 11x^10$
   (b) $f(x) = -4\cos(4x)$
   (c) $f(y) = \frac{-2}{y^3}$
6. Solve the indefinite integrals
   (a) $\int(3x^5 - 5x^9)dx$
   (b) $\int(\sec^2 -1)dx$
   (c) $\int \frac{3}{4+v^2}dx$
7. Solve for the antiderivative using the initial conditions
   (a) $f(t) = \sec^2 t, F(\pi/4) = 1$
   (b) $g'(x) = 7x(x^6 - \frac{1}{7}), g(1) = 24$
   (c) $F''(x) = \cos x, F'(0) = 3, F(\pi) = 4$