MATH V1201 SECTIONS 002 & 003 HOMEWORK 7
DUE APRIL 1, 2015

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1. Some Stewart problems

(I.1) Stewart 14.2.43. (Use Mathematica to do the graphing.)
(I.2) Stewart 14.3.77.
(I.3) Stewart 14.3.78(a,b).
(I.4) Stewart 14.3.84.
(I.5) Stewart 14.3.86.
(I.6) Stewart 14.3.93.
(I.7) Stewart 14.3.101. (Use Mathematica to do the graphing.)

2. Showing limits exist using the squeeze theorem, two variable edition

Use the squeeze theorem to prove that each of the following limits exists (and, in the process, find what the limit is equal to):

(II.1) Use the Squeeze Theorem to show that $\lim_{(x,y)\to(0,0)} \frac{xy}{\sqrt{x^2+y^2}} = 0$ (cf. Stewart 14.2.13).
(II.2) Use the Squeeze Theorem to show that $\lim_{(x,y)\to(0,0)} \frac{x^2\sin^2(y)}{x^2+2y^2} = 0$ (cf. Stewart 14/2.16).

3. The polar coordinates trick

(II.1) Use polar coordinates to check that $\lim_{(x,y)\to(2,3)} \frac{(x-2)^2(y-3)^3}{x+y-5}$.
(II.2) (Optional.) Does $\lim_{(x,y)\to(0,0)} x\ln(y)$ exist? What happens if you apply the polar coordinates trick?
(II.3) (Optional.) Use the three-dimensional analogue, the *spherical coordinates trick*, to compute $\lim_{(x,y,z)\to(0,0,0)} \frac{xyz}{x^2+y^2+z^2}$.

4. Mathematica

(III.1) To Mathematica, all derivatives are partial derivatives. That is, every time you've used Mathematica's `D`, you've been computing a partial derivative. Use Mathematica to compute $\frac{\partial}{\partial x} xe^{xy}$ and $\frac{\partial}{\partial y} xe^{xy}$.
(III.2) Mathematica also likes computing higher-order partial derivatives. For example, to compute $\frac{\partial^3}{\partial x\partial y\partial x} xe^{xy}$ use:

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D[x*Exp[x*y], x, y, x]
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Try it.
(III.3) Use Mathematica to check your computation for Stewart 14.3.77.
(III.4) Use Mathematica to check your computations of Stewart 14.3.101(b).
(III.5) Use Mathematica to do the graphing portion of Stewart 14.2.43 and 14.3.101.

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