MATH 105 EXAM 2 NOVEMBER 11, 2005

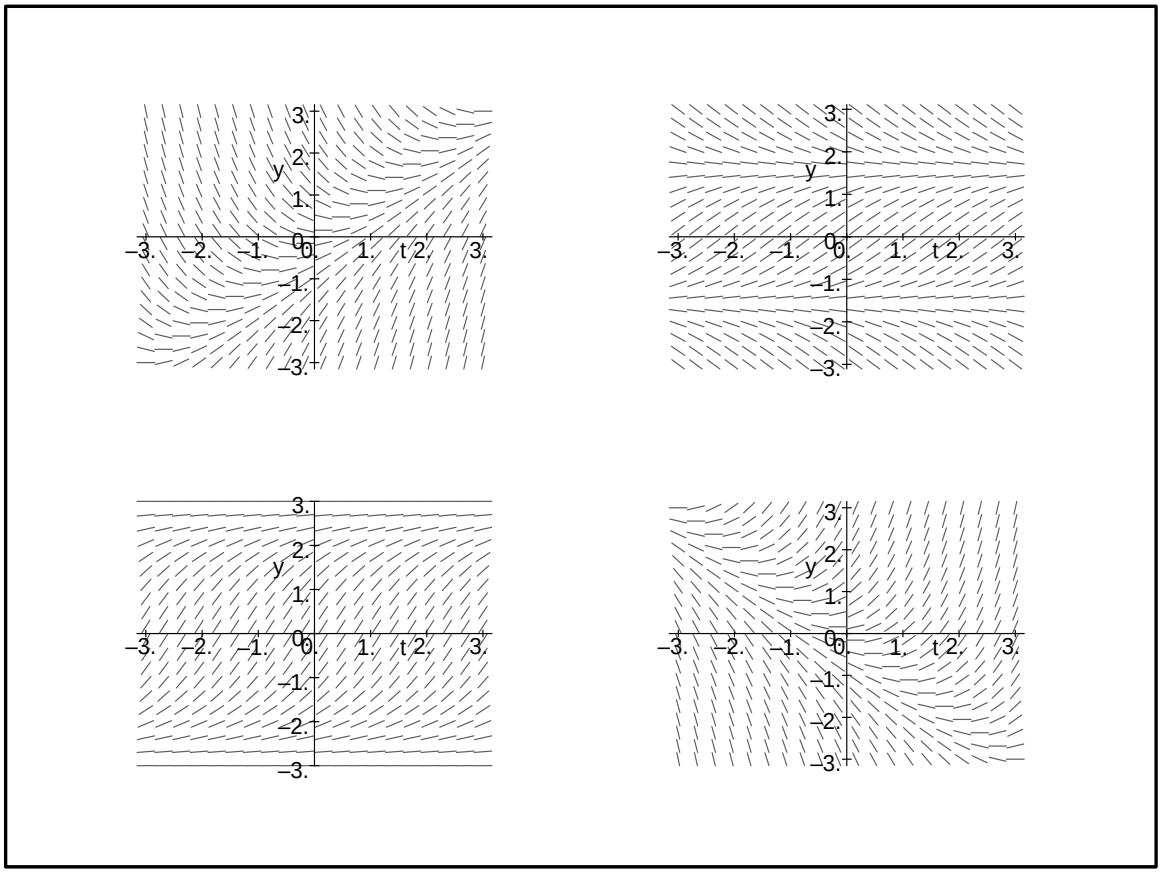
NAME: _____

YOUR GRADE IS BASED ON THE PROCESS AS WELL AS THE FINAL RESULT. SHOW ALL YOUR STEPS CLEARLY SO YOU WILL BE ELIGIBLE FOR THE MOST PARTIAL CREDIT. YOU MAY USE A CALCULATOR, BUT NO NOTES, BOOKS, OR OTHER STUDENTS. GOOD LUCK!

1.) (10 pts.) Each differential equation below matches one of the shown slope fields. Which DE matches which slope field? Justify your answers.

a.) $\dfrac{dy}{dt} = \cos y$ b.) $\dfrac{dy}{dt} = 1 + \cos y$

c.) $\dfrac{dy}{dt} = t + y$ d.) $\dfrac{dy}{dt} = t - y$



2.) (15 pts.) A wire 20 inches long may be cut once. Form one of the resulting pieces into a square, and the other into a circle. Where should you make the cut in order to maximize the total enclosed area? *Hints: the area of a circle with radius r is πr^2. The circumference is $2\pi r$.*

3.) (15 pts.) Compute derivatives of the following functions.

a.) (7 pts.) $y = (x^3 + \cos(\sqrt{x}) - e^{\pi})^{14}$

b.) (8 pts.) $y = x^{\sin x}$

4.) (15 pts.) Given the expression $(x^2 + y^2)^2 = 4x^2y$,

a.) (5 pts.) use implicit differentiation to take the derivative of both sides of the equation;

b.) (5 pts.) solve for $\frac{dy}{dx}$; and

c.) (5 pts.) find the equation of the tangent line to the graph of the equation, through the point $(-1, 1)$.

5.) (15 pts.)

a.) (5 pts.) Use a reference triangle to rewrite $\cos(\arcsin(3x))$ as an algebraic expression, that is, an expression without trigonometric functions.

b.) (5 pts.) Find an antiderivative of the function $f(x) = \dfrac{2x - e^x}{x^2 - e^x + \pi}$.

c.) (5 pts.) Find an antiderivative of the function $g(x) = \dfrac{1}{1 + 25x^2}$.

6.) (15 pts.) Compute the following limits.

a.) (7 pts.) $\lim_{x \to 0} \frac{2x}{e^x}$

b.) (8 pts.) $\lim_{x \to \infty} \frac{\ln x}{x}$

7.) (15 pts.) Find the Taylor polynomial of order 3 for the function $f(x) = e^x$, centered about the point $x = 0$.

BONUS: (5 pts.) Write an original poem about a calculus concept. You may submit your poem on a separate sheet of paper, or write it here or on the back of this page.