Math 10C, Spring 2001 May 2, 2001
Prof. Tesler

Homework #6, Due Thursday, May 10

10.3# 20, 21, 22
10.4# 1, 3, 13, 17
and the problems below.

Problem H-7. This is a continuation of problem 10.4# 13. Compare the values of $f(1.2, 0.3)$ and $L(1.2, 0.3)$.

An application of linearization is that $L(x, y)$ can be used to approximate $f(x, y)$ when (x, y) (here, $(1.2, 0.3)$) is close to where the linearization was based at (here, $(1, 0)$). Your calculator does not compute $\sqrt{x}$ (or most other functions) exactly; it uses an advanced version of this approximation method good for the number of decimals it shows on the screen, but not for the infinite number of digits $\sqrt{x}$ really has.

Problem H-8. Parametric plots. This and the next problem are based on the lectures from April 13, April 23, and May 2.

(i) Sketch the parametric curve $x = 3t + 1$, $y = 2t - 1$, for $-1 \le t \le 2$, by hand. To do this, make a table like the following, and then plot the points on ordinary xy-axes.

t	x	y	
-1	$3(-1) + 1 = -2$	$2(-1) - 1 = -3$	Plot $(x, y) = (-2, -3)$
$-.5$	$3(-.5) + 1 = -.5$	$2(-.5) - 1 = -2$	Plot $(-.5, -2)$
$\vdots$	$\vdots$	$\vdots$	$\vdots$
2			

Although graphing calculators can do this, the point is for you to learn how a parametric curve works with simple examples you can do by hand.

(ii) The curve in part (i) is a shape that you know. Solve for $y = f(x)$ (eliminating t altogether). What are the endpoints (in (x, y) coordinates) of the curve?

Problem H-9.

(i) Sketch the parametric curve $x = 4\cos(2t)$, $y = 4\sin(2t)$, for $\pi/5 \le t \le \pi/2$. Do this by making a table similar to the one above, with t taking on a number of values between $\pi/5$ and $\pi/2$, and then connecting the plotted points together smoothly. (You may use a calculator to compute the numerical values in the table, but do not use the graphing features of the calculator. Use radians.)

(ii) The curve in part (i) is a piece of a shape that you know. Rewrite it as an equation using only x and y by using a trig identity to get rid of t. What are the endpoints of the curve?

(iii) Rewrite the equation in part (i) as the vector parametric equation $\vec{r}(t) = \begin{bmatrix} x(t) \\ y(t) \end{bmatrix}$.

(iv) Compute the *velocity vector* $\vec{v}(t) = \vec{r}\,'(t)$ and the *speed* $v(t) = |\vec{r}\,'(t)|$.

(v) Make a copy of the picture you drew in (i). Compute $\vec{r}\,'(\pi/2)$ and draw it on this picture as a vector starting at the coordinates of $\vec{r}(\pi/2)$. Do the same with $t = \pi/3$ and $t = \pi/4$, all on the same copy of the picture.