MTH 234-61 **Multivariable Calculus** **10/17/11**

Review for Exam 2

Justify all your answers

1. Given that $\vec{r}'(t) = \langle \cos t \sin^2 t, \frac{1}{t-\pi+1} \rangle$ and $\vec{r}(\pi) = \langle 2, 3 \rangle$. Find $\vec{r}(t)$.

2. Find the arc length parameter for the curve $\vec{r}(t) = \langle 3\cos t, 3\sin t, 3 + \cos 4t, \sin 4t \rangle$ using $\vec{r}(0)$ as a base point.

3. Find the domain of the function $\tan(\frac{x}{y})$.

4. Given $f(x, y, z) = e^{x\cos(yz)} + \sin y + z$.
   (a) Compute ∇f.
   (b) Find the directional derivative of f at the point $(0, 0, 0)$ in the direction of $\langle 1, 1, 1 \rangle$.
   (c) Find the direction in which f decreases the most at the point $P_0 = (0, \pi, 1)$.

5. Let $f(x, y) = \frac{x^2 y}{2x^4 + 3y^2}$. Show that $\lim_{(x,y)\to(0,0)} f(x, y)$ does not exist.

6. Given that $w = xy + e^{x-z}$ and $x = \sin t, y = t$ and $z = t^2$. Use the chain rule to compute $\frac{\mathrm{d}w}{\mathrm{d}t}$

7. Compute f_{xyz} if $f(x, y, z) = \cos(xe^y)\sin(z)$.

8. Given that $f(x, y, z) = \sin(x^2 - yz)$. Find an equation for the tangent plane to the level surface of f at the point $(0, \pi, -1)$.

9. (a) Determine the linearization of the function $f(x, y, z) = \sqrt{x^2 + y^2 + z^2}$ at the point $(1, 2, 2)$.
   (b) Use (a) to estimate $\sqrt{0.9^2 + 2.1^2 + 1.9^2}$.