Name: ______________________________ **ID Number:** __________________

TA: ______________________________ **Section Time:** ________________

MTH 234	***No calculators or any other devices allowed.***
Exam 2: Practice	***If any question is not clear, ask for clarification.***
October 19, 2010	***No credit will be given for illegible solutions.***
50 minutes	***If you present different answers for the same problem,***
Sects: 13.1, 13.3,	***the worst answer will be graded.***
14.1-14.7.	***Show all your work.*** $\boxed{\textit{Box your answers.}}$

1. (a) (15 points) Find the position $\boldsymbol{r}$ and velocity vector functions $\boldsymbol{v}$ of a particle that moves with an acceleration function $\boldsymbol{a}(t) = \langle 0, 0, -10 \rangle \ m/sec^2$, knowing that the initial velocity and position are given by, respectively, $\boldsymbol{v}(0) = \langle 0, 1, 2 \rangle \ m/sec$ and $\boldsymbol{r}(0) = \langle 0, 0, 3 \rangle \ m$.

(b) (5 points) Draw an approximate picture of the graph of $\boldsymbol{r}(t)$ for $t \geq 0$.

2. (a) (10 points) Find and sketch the domain of the function $f(x,t) = \ln(3x + 2t)$.

(b) (10 points) Find all possible constants c such that the function $f(x,t)$ above is solution of the wave equation, $f_{tt} - c^2 f_{xx} = 0$.

3. (a) (10 points) Find the direction in which $f(x,y)$ increases the most rapidly, and the directions in which $f(x,y)$ decreases the most rapidly at P_0, and also find the value of the directional derivative of $f(x,y)$ at P_0 along these directions, where

$$f(x,y) = x^3 e^{-2y}, \quad \text{and} \quad P_0 = (1,0).$$

(b) (10 points) Find the directional derivative of $f(x,y)$ above at the point P_0 in the direction given by $\boldsymbol{v} = \langle 1, -1 \rangle$.

4. (a) (10 points) Find the tangent plane approximation of $f(x, y) = x\cos(\pi y/2) - y^2e^{-x}$ at the point $(0, 1)$.

(b) (10 points) Use the linear approximation computed above to approximate the value of $f(-0.1, 0.9)$.

5. (20 points) Find every local and absolute extrema of $f(x, y) = x^2 + 3y^2 + 2y$ on the unit disk $x^2 + y^2 \leq 1$, and indicate which ones are the absolute extrema. In the case of the interior stationary points, decide whether they are local maximum, minimum of saddle points.

#	Pts	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Σ	100	