Exam 2

Tmath 126

Summer 2012

1. [12] TRUE/FALSE: Identify a statement as True in each of the following cases if the statement is *always* true and provide a brief justification. Otherwise, identify it as false and provide a counterexample.

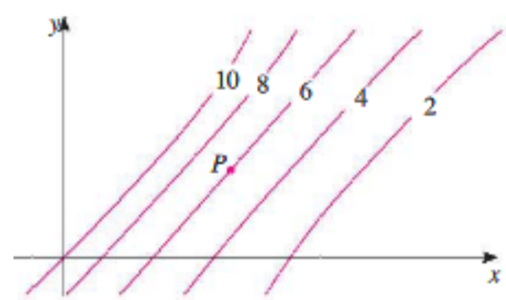
   Recall that $\cdot$ refers to the dot product, and $\times$ refers to the cross product.

   (a) (Practice Exam #2) If $P = (1, 3, 2)$ and $R = (3, -1, 6)$ are in $\mathbb{R}^3$, then the vector $\overrightarrow{PR}$ has components $\langle 2, -4, 4\rangle$.

   (b) (Summer '11 Exam1 #2f) If $\overrightarrow{u} = \langle -2, -6\rangle$ and $\overrightarrow{v} = \langle 1, -3\rangle$ in $\mathbb{R}^2$ then the projection of $\overrightarrow{v}$ onto $\overrightarrow{u}$ is $\langle \frac{-4}{5}, \frac{12}{5}\rangle$.

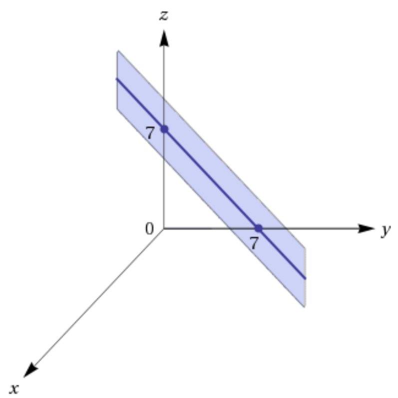
   (c) (Quiz 3 #1) The volume of a parallelepiped with edges $\overline{PQ}$, $\overline{PR}$ and $\overline{PS}$ can be found by computing $(\overrightarrow{PQ} \cdot \overrightarrow{PR}) \times \overrightarrow{PS}$.

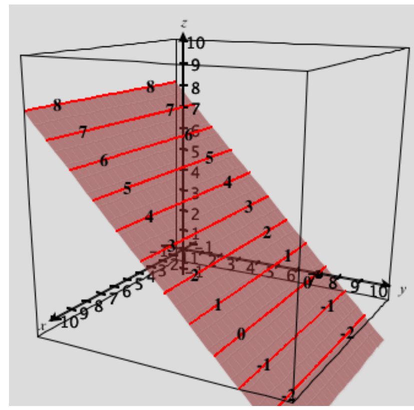
   (d) (§14.1 #74) Level curves are shown for the function f. From this we know $f_x > 0$.



Show your work for the following problems. The correct answer with no supporting work will receive NO credit.

2. Consider the surface sitting in three dimensions shown from two views (one with contour lines) below :





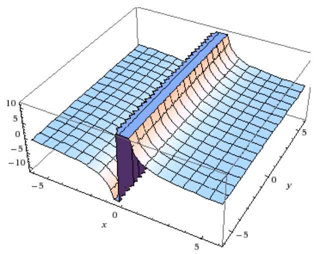
(a) [1] (3D & vector wks #2) Identify a point (coordinate) that is on the surface.

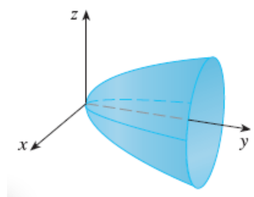
(b) [2] (PracticeExam #3) Does the surface define z as a function of x and/or y? Why or why not?

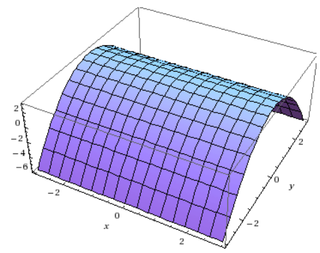
(c) [3] (§12.4 #32) Identify a unit vector that is normal/orthogonal/perpendicular to the surface shown. (You need not use calculus here, but be sure to *justify* your answer.)

(d) [2] (WebHW7 #2) Write an equation(s) for the surface.

(e) [4] (WebHW9 #9) Find the distance from the point $(-1, 9, 5)$ to the surface shown.

i) 

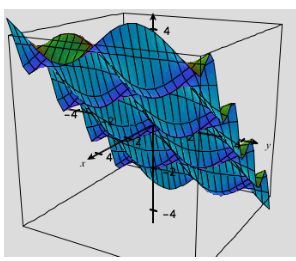
ii) 

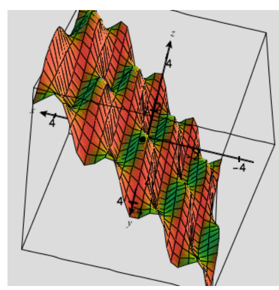
iii) 

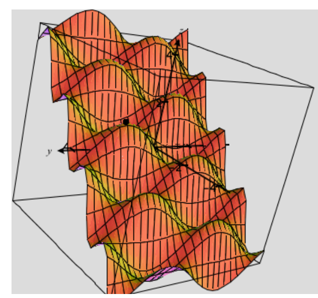
3. [4] (WebHW9 #10,11,14) Consider the three graphs above. Match the following equations to their respective graphs:

A. $yz = 6$ B. $z = 3 - y^2$ C. $y = 2x^2 + z^2$

4. (Summer '11 Exam2 #5) Three views of the function $f(x, y) = x + \cos(3x)\sin(y)$ are shown below and may be used for the following questions. The point $(0, \frac{\pi}{2}, f\left(0, \frac{\pi}{2}\right))$ is identified on the graph.







(a) [3] Find the gradient of f.

(b) [3] Find the directional derivative of f at the point $(0, \frac{\pi}{2})$ in the direction of $\frac{1}{\sqrt{5}}\left(\vec{i} - 2\vec{j}\right)$.

(c) [3] (§14.4 #16) Find the linearization of f at the point $(0, \frac{\pi}{2})$.

5. (§14.7 #25) Consider the function $g(x, y) = x^4 + y^4 - 4x^2y + 2y$. Three views of the function g are shown below.

   (a) [3] *Clearly outline* steps to identify all critical points and then classify them as local minimums, local maximums, or saddle points.

   (b) [5] Perform the above steps to find all the critical points and classify them.