

**You must show appropriate work for credit.**

1) Find the equation of the plane that intersects the  $xz$ -plane along the line  $z = 10 - 2x$  and intersects the  $yz$ -plane along the line  $z = 10 - 5y$

2) Express  $f(x, y) = \sin(5x^2 - 3y)$  as one particular level surface of a function  $g(x, y, z)$  (there are many possible answers).

The  $g =$  \_\_\_\_\_ level surface of  $g(x, y, z) =$  \_\_\_\_\_

3)  $\mathbf{v} = 4\mathbf{i} + 4\mathbf{j} + 2\mathbf{k}$ ,  $\mathbf{w} = 2\mathbf{i} + 3\mathbf{j} + 6\mathbf{k}$

a)  $\mathbf{v} \cdot \mathbf{w} =$

b)  $\mathbf{v} \times \mathbf{w} =$

c) What is the angle (in radians) formed by  $\mathbf{v}$  and  $\mathbf{w}$ ?

d) What is the equation of the plane containing  $\mathbf{v}$ ,  $\mathbf{w}$  and the point  $(1, -2, -5)$ ? (note: you do not need to solve the equation for  $z$ )

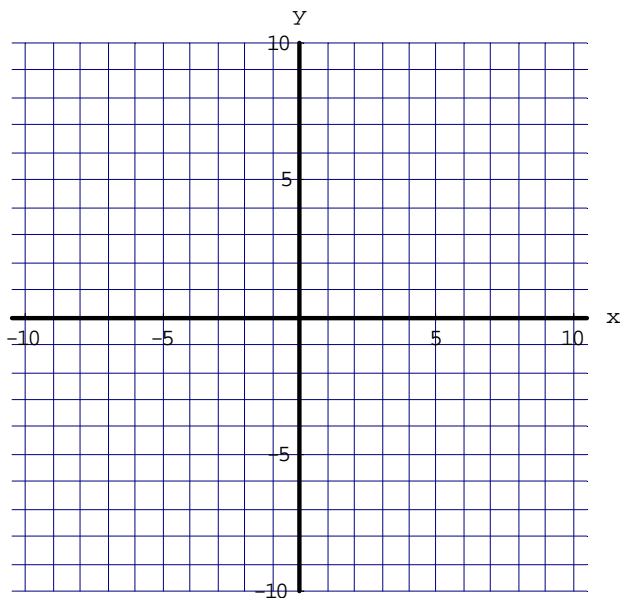
4) For each function, calculate the following derivatives:  $f_x$ ,  $f_y$

a)  $f(x, y) = 5x^2 + 3x^2y - 4y^3$

b)  $f(x, y) = e^{y^2 - 4x}$

5)  $z = f(x, y) = xy$

a.) Make a contour diagram of  $f$  for the following  $z$ -values:  $z = -4, -1, 1, 4$ . Be sure to label your level curves.



b.) Draw a 3D sketch of the graph of  $f$ , and briefly describe the graph in words.