

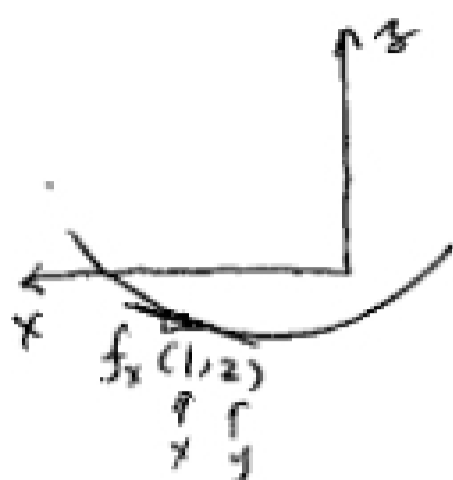
MATH 2339, HW16: Solution

(12)

§11.3

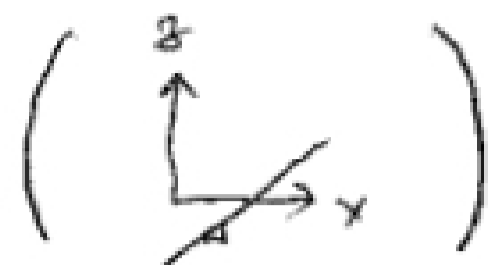
3/  
②

(a)

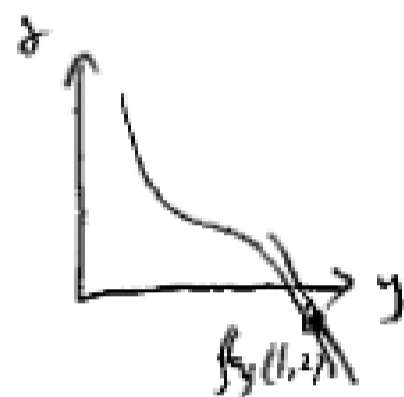


$$f_x(1, 2) > 0$$

+



(b)



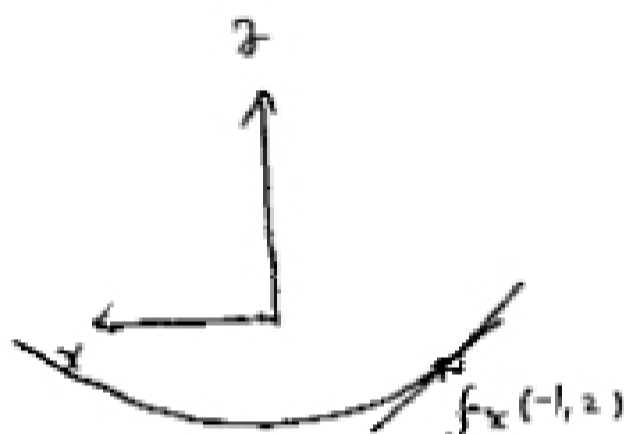
$$f_y(1, 2) < 0$$

-



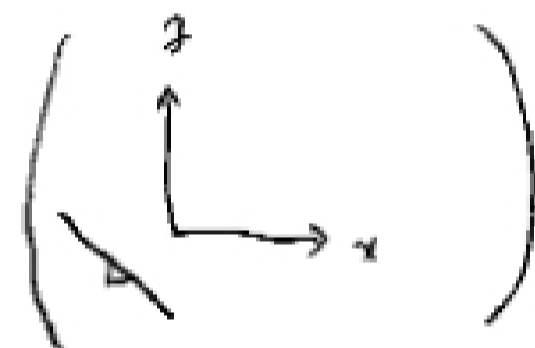
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(a)

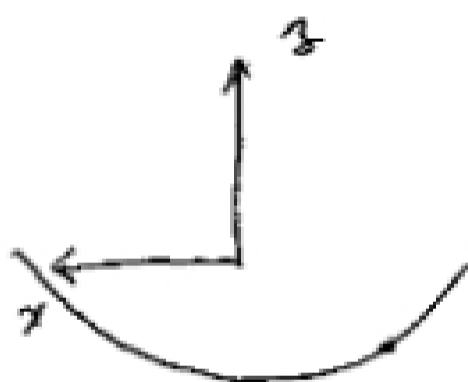


$$f_x(-1, 2) \leq 0$$

-



(b)



$$f_{xx}(-1, 2) > 0$$

+

(Concave up)

5/  
④

$$f(x, y) = 16 - 4x^2 - y^2$$

$$f_x = -8x, \quad f_x(1, 2) = -8 \times 1 = -8$$

$$f_y = -2y, \quad f_y(1, 2) = -2 \times 2 = -4$$

77/.

(4)

$$4x^2 + 2y^2 + z^2 = 16$$

The tangent line to the curve:  $4x^2 + 2y^2 + z^2 = 16, y=2$   
(i.e.  $4x^2 + z^2 = 8, y=2$ )

at the point  $(1, 2, 2)$  has the slope  $\frac{\partial z}{\partial x} (1, 2, 2)$ .

$$\frac{\partial}{\partial x} (4x^2 + 2y^2 + z^2) = \frac{\partial}{\partial x} (16) \Rightarrow$$

$$8x^2 + 2z \frac{\partial z}{\partial x} = 0 \Rightarrow \frac{\partial z}{\partial x} = -\frac{4x^2}{z}$$

$$\text{So } \left. \frac{\partial z}{\partial x} \right|_{(1, 2, 2)} = -\frac{4 \times 1^2}{2} = -2$$

The symmetric eqns of the tangent line are:

$$z - 2 = (-2)(x - 1), \quad y = 2$$

$$\text{i.e. } \frac{z - 2}{-2} = \frac{x - 1}{1}, \quad y = 2$$

Parametric eqs. of the tangent line are:

$$z = 2 - 2t, \quad x = 1 + t, \quad y = 2$$