

$$3(x-2) - (y-3) + 7(z-4) = 0$$

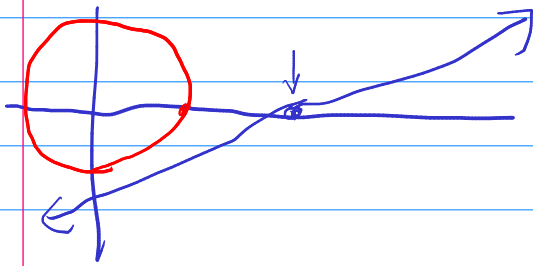
$$3x - 6 - y + 3 + 7z - 28 = 0$$

$$3x - y + 7z = 31$$

$$\langle 4, 1 \rangle$$

$$\left\langle \frac{4}{\sqrt{17}}, \frac{1}{\sqrt{17}} \right\rangle$$

$$\langle 2, 0 \rangle + t \left\langle \frac{4}{\sqrt{17}}, \frac{1}{\sqrt{17}} \right\rangle$$



$$x^2 + y^2 = r^2$$

$$a^2 + b^2 = c^2$$

$$f(x, y) = x^2 + 2y^2$$

$$\frac{\partial}{\partial x} f(x, y) = 2x$$

$$g(x, y) = x^2 + 2xy + 3y^2 \quad \frac{\partial}{\partial y} g(x, y) = 2x + 6y$$

$$\frac{\partial}{\partial x} g(x, y) = 2x + 2y$$

$$2 \left( \frac{d}{dx}(x) \cdot y + \cancel{\frac{d}{dx} y(x)} \right)$$

$$\frac{\partial}{\partial x} f(x, y)$$

$$\hookrightarrow f_x(x, y)$$

$$\frac{\partial}{\partial y} f(x, y)$$

$$f_y(x, y)$$

$$\frac{\partial}{\partial x} (\cos(xy) + \ln(x) + \cancel{xy^2})$$

$$\frac{\partial}{\partial y} (-y \sin(xy)) + \frac{1}{x} + y^2$$

$$\downarrow \quad \downarrow$$

$$-\sin(xy) - y/x \cos(xy) + 2y$$

$$\frac{\partial}{\partial y} (\cos(xy) + \ln(x) + \cancel{xy^2})$$

$$\frac{\partial}{\partial x} (-x \sin(xy)) + 2xy$$

$$2y$$

$$f_{xy}(x, y)$$

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

$$x = \sin(t)$$

$$y = e^{5t}$$

$$\frac{\partial z}{\partial x} = 2xy + 1$$

$$\frac{\partial z}{\partial y} = x^2$$

$$\frac{dx}{dt} = \cos(t)$$

$$\frac{dy}{dt} = 5e^{5t}$$

$$\frac{dz}{dt} = (2xy + 1) \cos(t) + (x^2) (5e^{5t})$$

$$\frac{dz}{dt}$$

$$(2 \sin(t) e^{5t} + 1) \cos(t) + (\sin(t))^2 5 e^{5t}$$

$$3. f(x, y) = e^x \sin(x^2 y)$$

$$f_x = e^x 2xy \cos(x^2 y) + e^x \sin(x^2 y)$$

$$f_y = e^x x^2 \cos(x^2 y)$$

$$f_{xy} = e^x (-2x^3 y \sin(x^2 y) + 2x \cos(x^2 y)) + e^x x^2 \cos(x^2 y)$$

$$f_{xx}$$

$$f_{yy} = -e^x x^4 \sin(x^2 y)$$