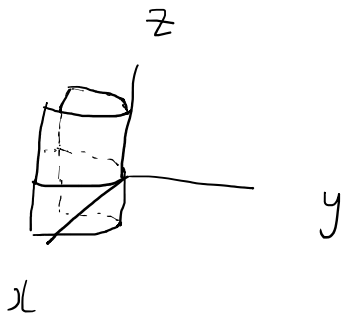
Math250B Asst1 Solutions

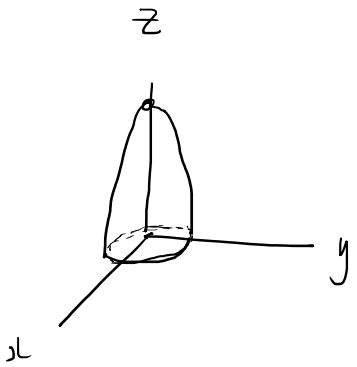
September 8, 2020 9:51 AM

(1) a)



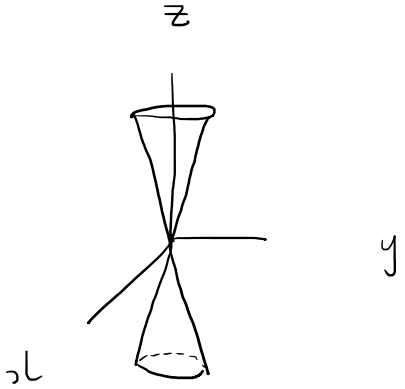
(parabolic) cylinder

b)



paraboloid

c) $z = \pm 9\sqrt{x^2+y^2}$



cone
(with 2 nappes)

(2) $f_x = 2xe^{3y}\ln(z^3+1) + \dfrac{y^4z^6}{1+x^2}$

$f_y = 3x^2e^{3y}\ln(z^3+1) + 4y^3z^6\arctan x$

$f_z = \dfrac{3x^2e^{3y}z^2}{z^3+1} + 6y^4z^5\arctan x$

(3) $f_x = 2xyz\cos x^2$

$f_{xx} = 2yz\cos x^2 - 4x^2yz\sin x^2$

(Product Rule)

(4) $\vec{n} = [-z_x, -z_y, 1]$

Horizontal tangent plane $\Rightarrow \vec{n} = [0,0,1]$

Therefore, we set $z_x = 0$ and $z_y = 0$

$z_x = 3x^2 - 12 = 3(x^2-4) = 3(x-2)(x+2) = 0$

$\Rightarrow x = \pm 2$

$z_y = 2y + 8 = 2(y+4) = 0 \Rightarrow y = -4$

There are 2 possibilities: $(x, y) = (-2, -4)$ and $(2, -4)$

Use the equation in the question to find z

Answer: $(-2, -4, 10)$ and $(2, -4, -22)$