10) Find the equation of the tangent plane to the surface $z = \sqrt{18 - 2x^2 - y^2}$ at the point (2, 3, 1).

$f_x = \frac{1}{2}(18 - 2x^2 - y^2)^{-1/2} \cdot (-4x) = \frac{-2x}{\sqrt{18 - 2x^2 - y^2}}$ $\qquad f_x(2,3) = \frac{-4}{1} = -4$

$f_y = \frac{1}{2}(18 - 2x^2 - y^2)^{-1/2} \cdot (-2y) = \frac{-y}{\sqrt{18 - 2x^2 - y^2}}$ $\qquad f_y(2,3) = \frac{-3}{1} = -3$

plane $\quad z - z_0 = f_x(x_0, y_0)(x - x_0) + f_y(x_0, y_0)(y - y_0)$

$z - 1 = -4(x-2) - 3(y-3)$

$z - 1 = -4x + 8 - 3y + 9$

$\boxed{4x + 3y + z = 18}$

11) Use differentials and the formula $V = \pi r^2 h$ to estimate the amount of tin in a cylindrical tin can with diameter 5 cm and height 8cm if the sides are 0.04 cm thick and the top and bottom are 0.06 cm thick.

$\Delta V \approx dV = \frac{\partial V}{\partial r} dr + \frac{\partial V}{\partial h} dh$ $\qquad dr \approx \Delta r = .04$, $\quad dh \approx \Delta h = 2(.06) = .12$

$dV = 2\pi r h(.04) + \pi r^2(.12)$

$dV\Big|_{\substack{r=2.5\\h=8}} = 2\pi(2.5)(8)(.04) + \pi(2.5)^2 \cdot (1.2)$

$= 1.6\pi + .75\pi = 2.35\pi \approx 7.38 \text{ cm}^3$