First and second Derivatives of V_2.

A

$\frac{\partial V_2}{\partial x}$ = pg 8.

$$\frac{\partial V_2}{\partial x} = \frac{-x}{R_2^3}$$ pg 8

$$\frac{\partial V_2}{\partial y} = \cdot \quad \frac{\partial V_2}{\partial y} = \frac{-y}{R_2^3}$$

$$\frac{\partial^2 V_2}{\partial z\,\partial x} = \frac{3x(z+c)}{R_2^5}$$ pg 8.

$$\frac{\partial^2 V_2}{\partial z\,\partial y} = \frac{3y(z+c)}{R_2^5}$$

$$\frac{\partial V_2}{\partial z} = \frac{-(z+c)}{R_2^3}$$ pg 12

$$\frac{\partial^2 V_2}{\partial z\,\partial z} = \frac{-1}{R_2^3} + \frac{3(z+c)^2}{R_2^5}$$ pg 12

$$V_2 = \frac{1}{R_2}$$

When

$$R_2 = \left(x^2 + y^2 + (z+c)^2\right)^{1/2}$$

THIRD Derivative of V_2 (B)

$$\frac{\partial^3 V_2}{\partial x \partial z^2} = \frac{\partial}{\partial x}\left[\frac{\partial^2 V_2}{\partial z^2}\right]$$

$$\frac{\partial^3 V_2}{\partial x \partial z^2} = \frac{\partial}{\partial x}\left[\frac{-1}{R_2^3}\right] + \frac{\partial}{\partial x}\left[\frac{3(z+c)^2}{R_2^5}\right]$$

$$= \frac{\partial}{\partial x}\left[-1\left(x^2+y^2+(z+c)^2\right)^{-3/2}\right] + \frac{\partial}{\partial x}\left[3(z+c)^2\left(x^2+y^2+(z+c)^2\right)^{-5/2}\right]$$

$$= -\left(-\frac{3}{\cancel{2}}\right)\left(x^2+y^2+(z+c)^2\right)^{-5/2}\cancel{2}x + 3(z+c)^2\left(-\frac{5}{\cancel{2}}\right)\left(x^2+y^2+(z+c)^2\right)^{-7/2}(\cancel{2}x)$$

$$\frac{\partial}{\partial x}\frac{\partial V_2}{\partial z^2} = \frac{3x}{R_2^5} - \frac{15x(z+c)^2}{R_2^7}$$

$$\frac{\partial^3 V_2}{\partial x \partial z^2} = \frac{3x}{R_2^5} - \frac{15x(z+c)^2}{R_2^7}$$

$$\frac{\partial^3 V_2}{\partial y \partial z^2} = \frac{3y}{R_2^5} - \frac{15y(z+c)^2}{R_2^7}$$

$$\frac{\partial^3 V_2}{\partial z \partial z^2} = \frac{\partial}{\partial z}\left[\frac{\partial^2 V_2}{\partial z^2}\right]$$

$$\frac{\partial^3 V_2}{\partial z \partial z^2} = \frac{\partial}{\partial z}\left[\frac{-1}{R_2^3}\right] + \frac{\partial}{\partial z}\left[\frac{3(z+c)^2}{R_2^5}\right]$$

Third derivatives of V_2 ©

$$\frac{\partial^3 V_2}{\partial_z \partial_z^2} = \frac{\partial}{\partial_z}\left[\frac{-1\,(x^2+y^2+(z+c)^2)}{}^{-3/2}\right] +$$

$$\frac{\partial}{\partial_z}\left[3(z+c)^2\left(x^2+y^2+(z+c)^2\right)^{-5/2}\right]$$

$$= -\left(\frac{-3}{\cancel{2}}\right)\left[x^2+y^2+(z+c)^2\right]^{-5/2}\cancel{2}(z+c) \quad +$$

$$6(z+c)\left(x^2+y^2+(z+c)^2\right)^{-5/2} + 3(z+c)^2\left(\frac{-5}{\cancel{2}}\right)\left(x^2+y^2+(z+c)^2\right)^{-7/2} \cdot \cancel{2}(z+c)$$

$$= \frac{3(z+c)}{R_2^5} + \frac{6(z+c)}{R_2^5} - \frac{15(z+c)^3}{R_2^7}$$

$$\frac{\partial^3 V_2}{\partial_z^3} = \frac{9(z+c)}{R_2^5} - \frac{15(z+c)^3}{R_2^7}$$