$$\Phi(\rho,\phi) = \frac{4V}{\pi} \sum_{n=0}^{\infty} \left(\frac{\rho}{b}\right)^{4n+2} \frac{\sin[(4n+2)\phi]}{2n+1}$$

First few terms:

$$\frac{4V}{\pi} \left\{ \left(\frac{\rho}{b}\right)^2 \frac{\sin[2\phi]}{1} + \left(\frac{\rho}{b}\right)^6 \frac{\sin[6\phi]}{3} + \left(\frac{\rho}{b}\right)^{10} \frac{\sin[10\phi]}{5} + \cdots \right\}$$

$$= \frac{2V}{\pi} \left\{ \left(\frac{\rho}{b}\right)^2 \frac{2\sin[2\phi]}{1} + \left(\frac{\rho}{b}\right)^6 \frac{2\sin[6\phi]}{3} + \left(\frac{\rho}{b}\right)^{10} \frac{2\sin[10\phi]}{5} + \cdots \right\}$$

$$\sin^3 2\phi = \frac{3}{4}\sin(2\phi) - \frac{1}{4}\sin(6\phi)$$

$$\sin^5(2\phi) = \frac{1}{2i}\frac{1}{16}\left[e^{i10\phi} - 5e^{i6\phi} + 10e^{i2\phi} - 10e^{-i2\phi} + 5e^{-i6\phi} - e^{-i10\phi}\right]$$

$$\sin^1(2\phi) = 1\sin(2\phi)$$

$$\sin^3(2\phi) = -\frac{1}{4}\left[\sin(6\phi) - 3\sin(2\phi)\right]$$

$$\sin^5(2\phi) = \frac{1}{16}\left[\sin(10\phi) - 5\sin(6\phi) + 10\sin(2\phi)\right]$$

The coefficients are clearly pascal triangle (half), with alternating sign

```
              1
           1/2  1
          1  3   3   1
          1  4   6   4   1
        1  5  10   10   5   1
      1  6  15  20  15   6   1
    1  7  21  35  35  21   7   1
  1  8  28  59  70
1  9  36  82  124
```

$$[2\sin(2\phi)]^1 = 2\sin(2\phi)$$

$$[2\sin(2\phi)]^3 = -2\left[\sin(6\phi) - 3\sin(2\phi)\right]$$

$$[2\sin(2\phi)]^5 = 2\left[\sin(10\phi) - 5\sin(6\phi) + 10\sin(2\phi)\right]$$

$$[2\sin(2\phi)]^7 = -2\left[\sin(14\phi) - 7\sin(10\phi) + 21\sin(6\phi) - 35\sin(2\phi)\right]$$

$$\left[2\sin(2\phi)\right]^1 - \frac{1}{3}\left[2\sin(2\phi)\right]^3 + \frac{1}{5}\left[2\sin(2\phi)\right]^5 - \frac{1}{7}\left[2\sin(2\phi)\right]^7$$

$$= 2\sin(2\phi) + 2\frac{\sin(6\phi)}{3} - 2\sin(2\phi) + \frac{2\sin(10\phi)}{5} - \cdots$$

$$= 2\sin(2\phi)$$
$$-2\sin(2\phi) + 2\frac{\sin(6\phi)}{3}$$
$$+4\sin(2\phi) - 2\sin(6\phi) + \frac{2\sin(10\phi)}{5}$$
$$-10\sin(2\phi) + 6\sin(6\phi) - 2\sin(10\phi) + \frac{2}{7}\sin(14\phi)$$

terms we want

$$= 2\sin(2\phi)$$
$$-2\sin(2\phi) + \frac{2\sin(2\phi)}{3}$$
$$+(2)(2\sin(2\phi)) - 2\sin(6\phi) + \frac{2\sin(10\phi)}{5}$$
$$-(5)(2)\sin(2\phi) + (3)2\sin(6\phi) - 2\sin(10\phi) + \frac{2\sin(14\phi)}{7}$$