8. (10 points) The *electric potential* is a quantity of great importance in electrostatics. The electric potential $V(R)$ at a distance R along the axis perpendicular to the center of a charged disk with radius 1 is given by

$$V(R) = C\left(\sqrt{R^2+1} - R\right)$$

where C is a constant that depends on the choice of units that are being used.

(a) Show that for large numbers R,

$$V(R) \approx \frac{C}{2R}.$$

(Hint: $\sqrt{R^2+1} = R\sqrt{1+\frac{1}{R^2}}$ and remember that R is large.)

(b) Approximately how large should R be in order that the error in the approximation of $V(R)$ by $C/2R$ is less than 4% of $V(R)$?