Formula Sheet for Physics 2049 Exam 1

You may use these equations freely unless a problem specifically prescribes a different approach.

$e = 1.602 \times 10^{-19}$ C

$F = \frac{1}{4\pi\varepsilon_0}\frac{|q_1 q_2|}{r^2}$

$k = \frac{1}{4\pi\varepsilon_0} = 8.99 \times 10^9 \,\mathrm{N \cdot m^2 / C^2}$

$\vec{E} = \frac{\vec{F}}{q_0}$

$E = k\frac{q}{r^2}$ (point charge)

$E = \frac{q}{\varepsilon_0 A} = \frac{\sigma}{\varepsilon_0}$ (para. pl. cap.)

$\vec{\tau} = \vec{p} \times \vec{E}$

$U = -\vec{p} \cdot \vec{E}$

$\Phi_E = \int \vec{E} \cdot d\vec{A}$

$\oint \vec{E} \cdot d\vec{A} = \frac{Q_{encl}}{\varepsilon_0}$

$W_{a\to b} = -(U_b - U_a) = -\Delta U$

$U = \frac{1}{4\pi\varepsilon_0}\frac{qq_0}{r}$ (point charges)

$U = \frac{q_0}{4\pi\varepsilon_0}\sum_i \frac{q_i}{r_i}$

$V = \frac{U}{q_0} = \frac{1}{4\pi\varepsilon_0}\frac{q}{r}$ (point charge)

$V = \frac{U}{q_0} = \frac{1}{4\pi\varepsilon_0}\sum_i \frac{q_i}{r_i}$

$V = \frac{1}{4\pi\varepsilon_0}\int \frac{dq}{r}$

$V_a - V_b = \int_a^b \vec{E} \cdot d\vec{l}$

$\sin\theta = y/r$

$\cos\theta = x/r$

$\tan\theta = y/x$

$F_{cent} = m\, v^2/r$

$K = 1/2\, mv^2$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$S = 2\,\pi\, r$, $A = \pi\, r^2$

$A = 4\,\pi\, r^2$, $V = 4/3\,\pi\, r^3$

$A = 1/2\; b\; h$

$x = x_0 + v_{x0}t + 1/2\; a_x t^2$

$v_x = v_{x0} + a_x t \quad v^2 = v_0^2 + 2ad$

$C = \sqrt{A^2 + B^2}$