# Exam 1 Formulas

$$\vec{F} = q\vec{E}$$

$$\vec{F} = \frac{k q_1 q_2}{r_{12}^2}\hat{r}_{12} = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{r_{12}^2}\hat{r}_{12}$$

$$\phi_E = \oint \vec{E}\cdot d\vec{A}$$

$$\oint \vec{E}\cdot d\vec{A} = \frac{Q_{enclosed}}{\epsilon_0}$$

$$\vec{E} = \int_{vol} \frac{k\,dQ}{r^2}\hat{r}$$

$$\int u^n du = \frac{u^{n+1}}{n+1}$$

$$\int \frac{du}{u} = \ln|u|$$

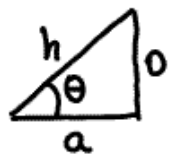
$$\int e^u du = e^u$$

$$\int \frac{x\,dx}{(x^2+a^2)^{1/2}} = \sqrt{x^2+a^2}$$

$|e| = 1.6\times10^{-19}$ coulombs

$k = 8.99\times10^{9}\ \frac{Nm^2}{C^2}$

$\epsilon_0 = 8.85\times10^{-12}\ C^2/Nm^2$




$\sin\theta = \frac{o}{h}$ $\cos\theta = \frac{a}{h}$

$\tan\theta = o/a$

Sphere: $A = 4\pi r^2$ $V = \frac{4}{3}\pi r^3$

cylinder: $A = 2\pi r L + 2\pi r^2$

$V = \pi r^2 L$

$$\left.\begin{aligned} V &= V_0 + at \\ x &= x_0 + V_0 t + \tfrac{1}{2}at^2 \\ V^2 &= V_0^2 + 2a(x - x_0) \\ x &= x_0 + \tfrac{1}{2}(V + V_0)t \end{aligned}\right] \text{valid with constant } a$$

$$a_c = \frac{mv^2}{r}$$

$s = r\theta$

$KE = \frac{1}{2}mv^2$

$PE_{spring} = \frac{1}{2}Kx^2$