Phys 2140 Your name here
Midterm Exam 1
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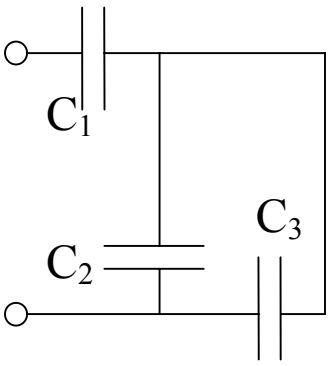
1. The electric potential in space between two flat parallel plates 1 and 2 is given (in volts) by $V=1500z^2$ where z (in centimeters) is the perpendicular distance from plate 1. At z=1 cm, (a) what is the magnitude of the electric field E and (b) is the field directed toward or away from plate 1?

$$E = -\frac{dV}{dz} = -3000z = -3000 \text{ V};$$

The negative sign makes E directed toward plate 1.

2. Find the equivalent capacitance of the combination assuming C_1=1 F, C_2=2 F, C_3=3 F. Express the result both in terms of C_1, C_2, C_3 and numerically. How does the result change when the capacitor C_3 is replaced by a conductor?



$$C_{23} = C_2 + C_3,$$

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_{23}},$$

$$C_{eq} = \frac{5}{6} \text{F}.$$

In the case of replacement C2 and C3 are shorted and do not contribute, hence,

$$C_{eq} = C_1$$