Key to Practice Test#1
1: A
2: B
3: E
4: 2.2E06 N/c/m²
5a: 2.2 N
5b: A
5c: 2.2E06 N/C
5d: D
5e: 2.1E06 N/C
5f: D
6a: -9.5E-04 C/m²
6b: 0
6c: 0
6d: +3.3E06 N/C/m²
6e: 18E06 V/m
7a: small charge at azimuthal angle φ: $dq = Qd\phi/(2\pi)$
at a distance $r$: $r^2=x^2+R^2-2xR\cos(\phi)$ - cosine theorem
creates field $dE=k Qd\phi/(2\pi)/r^2$
x-component of this field $dE_x=dE\cos(\alpha)$
$\cos(\alpha)=(x-R\cos(\phi))/r$
7b: y-component of the field of the upper half cancels the y-component of the field of the lower half, only $E_x$ survives
$E_x = k \frac{Q}{x^2} \int_0^{2\pi} \frac{1-u \cos \varphi}{(1+u^2-2u \cos \varphi)^{3/2}} d\varphi,$
where $u=R/x$
7c: expect
$E_x = k \frac{Q}{x^2},$
indeed the integral from 7b gives $2\pi$
7d: $E_x = k \frac{Q}{\pi R(x-R)}$
7e: A