

PHYS 1004**INTRODUCTORY ELECTROMAGNETISM AND WAVE MOTION****2013 Winter Term****Answers to Assigned Problems for Test #2 (Tutorial #3):****Gauss' Law and Electric Potential**

1. a) $0 \text{ Nm}^2/\text{C}$
b) $3.0 \times 10^{-2} \text{ Nm}^2/\text{C}$
2. $2.6 \times 10^{-5} \text{ C/m}^2$
3. a) $\vec{E} = 2.0 \times 10^2 \text{ N/C}$, upward from the plate
b) $\vec{E} = 2.0 \times 10^2 \text{ N/C}$, downward from the plate
4. $190 \text{ Nm}^2/\text{C}$
5. a) 1.0 kN/C
b) $120 \text{ Nm}^2/\text{C}$
c) 1.1 nC
6. a) -100 nC
b) $+50 \text{ nC}$
7. a) $2.4 \times 10^{-6} \text{ C/m}^3$
b) 1.2 nC , 10 nC , 80 nC
c) 4.5 kN/C , 9.0 kN/C , $1.8 \times 10^4 \text{ N/C}$
8. a) -10 nC
b) $+10 \text{ nC}$
c) $+48 \text{ nC}$
9. $\vec{E}(4 \text{ cm}) = 2.5 \times 10^4 \text{ N/C}$, outward
 $\vec{E}(8 \text{ cm}) = 0 \text{ N/C}$
 $\vec{E}(12 \text{ cm}) = 7.9 \times 10^3 \text{ N/C}$ outward
10. a) $\vec{E}(r < R) = \frac{\lambda}{2\pi\epsilon_0} \hat{r}$
b) $\vec{E}(r > R) = \frac{3\lambda}{2\pi\epsilon_0} \hat{r}$
c) radially outward ($+\hat{r}$ direction)
11. $1.4 \times 10^5 \text{ m/s}$
12. $1.9 \times 10^7 \text{ m/s}$
13. a) 200 V
b) 0.62 nC
14. a) $V_A = V_B = 1800 \text{ V}$, $V_C = 900 \text{ V}$
b) $\Delta V_{AB} = 0 \text{ V}$, $\Delta V_{BC} = 900 \text{ V}$
15. 1.4 kV
16. 0 V
17. 10 nC
18. $x = +3.0 \text{ cm}$ and $x = +6.0 \text{ cm}$
19. $\frac{Q}{4\pi\epsilon_0 L} \ln\left(\frac{x+L/2}{x-L/2}\right)$
20. $\frac{Q}{4\pi\epsilon_0 R}$