• Walk-In tutoring at Broward Hall
• Private-Appointment, one-on-one tutoring at Broward Hall
• Walk-In tutoring in LIT 215
• Supplemental Instruction
• Video resources for Math and Science classes at UF
• Written exam reviews and copies of previous exams

The teaching center is located in the basement of Broward Hall:

You can learn more about the services offered by the teaching center by visiting https://teachingcenter.ufl.edu/
1. The figure below shows an arrangement of four charged particles, with angle $\theta = 30^\circ$ and distance $d = 2.00$ cm. Particle 2 has charge $q_2 = 8.00 \times 10^{19}$ C; particles 3 and 4 have charges $q_3 = q_4 = 1.60 \times 10^{19}$ C. What is distance $D$ between the origin and particle 2 if the net electrostatic force on particle 1 due to the other particles is zero?

![Diagram of charged particles](image)

A. 1.92 cm  
B. 2.26 cm  
C. 5.34 cm  
D. 1.18 cm  
E. 2.89 cm

2. A particle of charge $Q$ is fixed at the origin of an $xy$ coordinate system. At $t = 0$ a particle ($m = 0.800$ g, $q = 4.00$ mC) is located on the $x$ axis at $x = 20.0$ cm, moving with a speed of 50.0 m/s in the positive $y$ direction. For what value of $Q$ will the moving particle execute circular motion? (Neglect the gravitational force on the particle.)

A. $1.06 \times 10^{-5}$ C  
B. $2.29 \times 10^{-5}$ C  
C. $-1.59 \times 10^{-5}$ C  
D. $-1.11 \times 10^{-5}$ C  
E. $-3.17 \times 10^{-5}$ C

3. In the figure below, a semi-infinite nonconducting rod (that is, infinite in one direction only) has uniform linear charge density $\lambda$. Find the angle (relative to the rod) of the net electric field at point $P$.

![Diagram of the rod](image)

A. $28^\circ$  
B. $45^\circ$  
C. $49^\circ$  
D. $52^\circ$  
E. $60^\circ$
4. At some instant the velocity components of an electron moving between two charged parallel plates are $v_x = 1.5 \times 10^5$ m/s and $v_y = 3.0 \times 10^3$ m/s. Suppose the electric field between the plates is given by $\vec{E} = (120 \text{N/C}) \hat{j}$. What is the electron's speed when its x coordinate has changed by 2.0 cm?

A. $3.95 \times 10^6$ m/s
B. $2.2 \times 10^6$ m/s
C. $3.18 \times 10^6$ m/s
D. $7.23 \times 10^6$ m/s
E. $8.86 \times 10^6$ m/s

5. A particle of charge $q$ is placed at one corner of a Gaussian cube. Which of the following gives the flux through a single cube face that is not adjacent to the charge?

A. $\frac{q}{4\epsilon_0}$
B. $\frac{q}{6\epsilon_0}$
C. $\frac{q}{12\epsilon_0}$
D. $\frac{q}{16\epsilon_0}$
E. $\frac{q}{24\epsilon_0}$

6. A charged particle is held at the center of a spherical shell. The figure below gives the magnitude $E$ of the electric field versus radial distance $r$. The scale of the vertical axis is set by $E_s = 10.0 \times 10^7$ N/C. What is the net charge on the shell?

![Graph of electric field magnitude versus radial distance](image)

A. $1.1 \mu C$
B. $2.7 \mu C$
C. $6.6 \mu C$
D. $7.1 \mu C$
E. $9.4 \mu C$
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7. In the figure below, three thin plastic rods form quarter-circles with a common center of curvature
at the origin. The uniform charges on the rods are \( Q_1 = 30 \text{ nC} \), \( Q_2 = 3Q_1 \), and \( Q_3 = 8Q_1 \). What
is the net electric potential at the origin due to the rods?

A. \( 3.2 \times 10^4 \text{ V} \)  B. \( 1.8 \times 10^4 \text{ V} \)  C. \( -2.6 \times 10^4 \text{ V} \)  D. \( -3.0 \times 10^4 \text{ V} \)  E. \( 1.3 \times 10^4 \text{ V} \)

8. Two electrons are fixed 2.0 cm apart. Another electron is shot from infinity and stops midway
between the two. What is its initial speed?

A. 320 m/s  B. 39 m/s  C. 58 m/s  D. 220 m/s  E. 150 m/s

9. A nonuniform linear charge distribution given by \( \lambda = bx \), where \( b \) is a constant, is located along
an x axis from \( x = 0 \) to \( x = 0.20 \text{ m} \). If \( b = 20 \text{nC/m}^2 \) and \( V = 0 \) at infinity, what is the
electric potential at the point \( y = 0.15 \text{ m} \) on the y axis?

A. 6 V  B. 8 V  C. 10 V  D. 12 V  E. 18 V

10. An electron is shot directly toward the center of a large metal plate that has surface charge
density \( -2.0 \times 10^{-6} \text{ C/m}^2 \). If the initial kinetic energy of the electron is \( 1.60 \times 10^{17} \text{ J} \) and if
the electron is to stop (due to electrostatic repulsion from the plate) just as it reaches the plate,
how far from the plate must the launch point be?

A. \( 4.4 \times 10^{-4} \text{ m} \)  B. \( 2.3 \times 10^{-4} \text{ m} \)  C. \( 1.8 \times 10^{-4} \text{ m} \)  D. \( 8.8 \times 10^{-4} \text{ m} \)  E. \( 3.9 \times 10^{-4} \text{ m} \)