• 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, $q = 4.00 \mu$C) 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 rod and point P](image)

A. 28°  
B. 45°  
C. 49°  
D. 52°  
E. 60°
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 $\vec{E} = (120 \text{N}/\text{C})\hat{j}$. What is the electron’s speed when its x coordinate has changed by 2.0 cm?

A. $3.18 \times 10^6$ m/s
B. $2.2 \times 10^6$ m/s
C. $2.8 \times 10^6$ 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. $\frac{q}{4\varepsilon_0}$
B. $\frac{q}{6\varepsilon_0}$
C. $\frac{q}{12\varepsilon_0}$
D. $\frac{q}{16\varepsilon_0}$
E. $\frac{q}{24\varepsilon_0}$

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 vs. radial distance]

A. $1.1 \mu C$
B. $2.7 \mu C$
C. $6.6 \mu C$
D. $7.1 \mu C$
E. $9.4 \mu C$
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?

\[
A. \ 3.2 \times 10^4 \, \text{V} \quad B. \ 1.8 \times 10^4 \, \text{V} \quad C. \ -2.6 \times 10^4 \, \text{V} \quad D. \ -3.0 \times 10^4 \, \text{V} \quad E. \ 1.3 \times 10^4 \, \text{V}
\]

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?

\[
A. \ 320 \, \text{m/s} \quad B. \ 39 \, \text{m/s} \quad C. \ 58 \, \text{m/s} \quad D. \ 220 \, \text{m/s} \quad E. \ 150 \, \text{m/s}
\]

9. A nonuniform linear charge distribution given by \( \lambda = bx, \) where \( b \) is a constant, is located along an \( \text{x} \) 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 \( \text{y} \) axis?

\[
A. \ 6 \, \text{V} \quad B. \ 8 \, \text{V} \quad C. \ 10 \, \text{V} \quad D. \ 12 \, \text{V} \quad E. \ 18 \, \text{V}
\]

10. The figure below gives the electric potential \( V(x) \) along a copper wire carrying uniform current, from a point of higher potential \( V_s = 12.0 \, \mu\text{V} \) at \( x = 0 \) to a point of zero potential at \( x_s = 3.00 \, \text{m}. \) The wire has a radius of 2.00 mm. What is the current in the wire? (The resistivity of copper is \( 1.69 \times 10^{-8} \Omega \cdot \text{m} \))

\[
A. \ B. \ 1.2 \, \text{mA} \quad B. \ 3.0 \, \text{mA} \quad C. \ B. \ 0.8 \, \text{mA} \quad D. \ B. \ 4.7 \, \text{mA} \quad E. \ B. \ 6.1 \, \text{mA}
\]