Q3 Cumulative

1. Eliminate the parameter t: $x = t^3 - 2$ and $2y = 1 - t^2$
   A. $y = 1 - \sqrt[3]{(x+2)^2}$
   B. $y = 1 + \sqrt[3]{(x22)^2}$
   C. $y = 1 + \sqrt{(x+2)^3}$
   D. $y = 1 - \sqrt[3]{(x+2)^2}$
2. Eliminate the parameter t: $x = 4\sin t + 1$ and $y = 3\cos t - 2$
   A. $\dfrac{(x-1)^2}{16} + \dfrac{(y+1)^2}{9} = 1$
   B. $\dfrac{(x-1)^2}{4} + \dfrac{(y+1)^2}{3} = 1$
   C. $\dfrac{(x-1)^2}{3} + \dfrac{(y+1)^2}{4} = 1$
   D. $\dfrac{x^2}{16} + \dfrac{y^2}{9} = 1$
3. Convert the polar coordinate $(6, -2\pi/3)$ to rectangular coordinates
   A. $(3, -3\sqrt{3})$
   B. $(3, 3\sqrt{3})$
   C. $(3\sqrt{3}, -3\sqrt{3})$
   D. $(-3, -3)$
   E. $(3, 3\sqrt{3})$
4. Convert this equation to polar coordinates: $x^2 - y^2 = 16$
   A. $r = \dfrac{4}{\cos^2\theta - \sin^2\theta}$
   B. $r = \dfrac{16}{\cos^2\theta + \sin^2\theta}$
   C. $r = \dfrac{4}{\cos^2\theta + \sin^2\theta}$
   D. $r = \dfrac{16}{\cos\theta - \sin\theta}$
5. Convert this equation to rectangular coordinates: $r = 3\sec\theta$
   A. $x = 3$
   B. $x = 1$
   C. $y = 3$
   D. $y = 1$
6. Which of the following is the graph of $r = \cos(3\theta)$
   A. A 3 leaf rose with x-intercept $(3, 0)$
   B. A 6 leaf rose with x-intercept $(1, 0)$
   C. A 3 leaf rose with no x intercept
   D. A 6 leaf rose with no x intercept
7. A baseball pitcher throws a baseball with an initial speed of 138 feet per second at an angle of 20° to the horizontal. The ball leaves the pitcher's hand at a height of 4 feet above the ground. Write the equations of motion, v_x and v_y for velocity and s_x, s_y for position.
   A. $v_x(t) = 138\cos(20°)$, $v_y(t) = 138\sin(20°) - 32t$, $s_x(t) = 138t\cos(20°)$, $s_y(t) = 138t\sin(20°) - 16t^2 + 4$

B. $v_x(t) = 138\cos(20°)$, $v_y(t) = 138\sin(20°) - 16t$, $s_x(t) = 138t\cos(20°)$, $s_y(t) = 138t\sin(20°) - 16t^2 + 4$

C. $v_x(t) = 138\cos(20°)$, $v_y(t) = 138\sin(20°) + 32t$, $s_x(t) = 138t\cos(20°)$, $s_y(t) = 138t\sin(20°) - 16t^2$

D. $v_x(t) = 138\cos(20°)$, $v_y(t) = 138\sin(20°) - 32t$, $s_x(t) = 138t\cos(20°)$, $s_y(t) = 138t\sin(20°) - 16t^2$

8. Let $u = \langle -3, 5\rangle$ and $\vec{v} = \langle 1, 4\rangle$ and $\vec{w} = \langle 6, -3\rangle$ find $\vec{u} + 2\vec{v} - \vec{w}$

A. $\langle -7, 16\rangle$

B. $\langle -8, 16\rangle$

C. $\langle -6, 14\rangle$

D. $\langle -7, 14\rangle$

E. $\langle -8, 16\rangle$

9. Given $\vec{u} = \langle 3\sqrt{3}, -5\rangle$, find $\|\vec{u}\|$

A. $2\sqrt{13}$

B. $3\sqrt{13}$

C. $2\sqrt{17}$

D. $3\sqrt{17}$

E. $\sqrt{2}$

10. Given $\vec{u} = \langle -10, 9\rangle$, find a unit vector in the direction of $\vec{u}$

A. $\langle -\frac{10}{\sqrt{181}}, \frac{9}{\sqrt{181}}\rangle$

B. $\langle -\frac{10}{\sqrt{19}}, \frac{9}{\sqrt{19}}\rangle$

C. $\langle -\frac{10}{\sqrt{181}}, -\frac{9}{\sqrt{181}}\rangle$

D. $\langle -\frac{10}{\sqrt{19}}, -\frac{9}{\sqrt{19}}\rangle$

E. $\langle -\frac{10}{\sqrt{181}}, -\frac{9}{\sqrt{181}}\rangle$

11. Which vector is perpendicular to $\langle \frac{2}{3}, -\frac{17}{2}\rangle$

A. $\langle -9, -\frac{18}{17}\rangle$

B. $\langle 9, \frac{18}{3}\rangle$

C. $\langle -9, -\frac{17}{18}\rangle$

D. $\langle -9, -17\rangle$

E. $\langle -6, -\frac{3}{17}\rangle$

12. Which vector is parallel to $\langle \frac{2}{3}, -\frac{17}{2}\rangle$

A. $\langle 4, -51\rangle$

B. $\langle 2, -25\rangle$

C. $\langle -51, 4\rangle$
D. $\langle 25, -2\rangle$
E. $\langle -4, -51\rangle$

13. What is the radian angle between $\langle 5, 1\rangle$ and $\langle 2, -3\rangle$
A. 1.181
B. 1.281
C. 1.481
D. 1.581
E. 1.781

14. If vector $\vec{x}$ has magnitude 9 and makes an angle of 3.4 radians with the positive x axis, find the components of x and write as $a\hat{i} + b\hat{j}$.
A. $-8.70\hat{i} - 2.30\hat{j}$
B. $8.70\hat{i}2.30\hat{j}$
C. $-2.30\hat{i} - 8.70\hat{j}$
D. $-9.20\hat{i}3.20\hat{j}$
E. $-9.20\hat{i} - 3.20\hat{j}$

15. Write the complex number $-3 + 9i$ in polar form.
A. $9.49e^{1.89i}$
B. $9.59e^{1.79i}$
C. $9.29e^{1.81i}$
D. $9.49e^{1.33i}$
E. $9.59e^{2.43i}$

16. Divide $10 - 9i$ by $2 - 4i$, and express your answer in the form $a + bi$.
A. $\frac{14}{5} + \frac{11}{10}i$
B. $-\frac{4}{5} + \frac{29}{10}i$
C. $-\frac{4}{5} - \frac{29}{10}i$
D. $\frac{14}{5} - \frac{11}{10}i$
E. $\frac{14}{5} - \frac{29}{10}i$

17. Simplify the product $\sqrt{7}e^{-i\pi/3} \cdot 3e^{i\pi/5}$.
A. $3\sqrt{7}e^{-2\pi i/15}$
B. $3\sqrt{7}e^{2\pi i/15}$
C. $3\sqrt{7}e^{-\pi i/15}$
D. $3\sqrt{7}e^{\pi i/15}$
E. $3\sqrt{7}e^{-\pi^2/15}$

18. Solve the equation $z^2 - 2z + 5 = 0$ for z and express your answers in rectangular form.
A. $1 \pm 2i$

19. If $z = 2 + i$ is one root of a quadratic equation $x^2 + bx + c$ with real coefficients, what is bc?
A. -20

20. If $z^4 = 16e^{2\pi i/5}$, find all values of z in polar form.
A. $z = 2e^{\pi i/10}, 2e^{3\pi i/5}, 2e^{11\pi i/10}, 2e^{8\pi i/5}$

21. Factor $z^2 + 9$ into a product of two binomials.
    A. $(z + 3i)(z - 3i)$
22. (Bonus): By multiplying two complex numbers, prove the addition identities for sin and cos.