1. Eliminate the parameter t: $x = t^3 - 2$ and $2y = 1 - t^2$
   A. $y = 1 - \sqrt[3]{(x+2)^2}$
   B. $y = 1 + \sqrt[3]{(x+2)^2}$
   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. $r^2 = \dfrac{16}{\cos^2\theta - \sin^2\theta}$
   B. $r^2 = \dfrac{4}{\cos^2\theta + \sin^2\theta}$
   C. $r^2 = \dfrac{16}{\cos^2\theta + \sin^2\theta}$
   D. $r^2 = \dfrac{4}{\cos\theta - \sin\theta}$
5. Convert this equation to rectangular coordinates: $r = 3\sec\theta$
   A. $x = 3$
   B. $x = 1/3$
   C. $y = 3$
   D. $y = 1/3$
6. Which of the following is the graph of $r = \cos(3\theta)$
   A. A 3 leaf rose with x-intercepts \$(0,0), $(1, 0)$
   B. A 6 leaf rose with x-intercepts $(0, 0), S(\pm 1, 0)$
   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. $v_x(t) = 129.7$, $v_y(t) = 47.2 - 32t$,
      $s_x(t) = 129.7t$, $s_y(t) = 47.2t - 16t^2 + 4$
   B. $v_x(t) = 129.7$, $v_y(t) = 47.2 - 16t$,

$s_x(t) = 129.7t,\ s_y(t) = 47.2t - 16t^2 + 4$

C. $v_x(t) = 129.7,\ v_y(t) = 47.2 + 32t,$
$s_x(t) = 129.7t,\ s_y(t) = 47.2t - 16t^2$

D. $v_x(t) = 129.7,\ v_y(t) = 47.2 - 32t,$
$s_x(t) = 129.7t,\ s_y(t) = 47.2t - 16t^2$

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. $\langle -7, 14\rangle$

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. $3\sqrt{17}$

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

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

A. $\langle -9, -\frac{6}{17}\rangle$
B. $\langle 9, \frac{18}{3}\rangle$
C. $\langle -9, -\frac{17}{18}\rangle$
D. $\langle -9, -17\rangle$

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. $\langle 25, -2\rangle$

13. What is the radian angle between $\langle 5, 1\rangle$ and $\langle 2, -3\rangle$

A. 1.180
B. 1.080
C. 1.480
D. 1.580

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. $-9.20\hat{i} + 3.20\hat{j}$
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. $9.49e^{1.33i}$
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. $\frac{14}{5} - \frac{11}{10}i$
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. $3\sqrt{7}e^{\pi i/15}$
18. Solve the equation $z^2 - 2z + 5 = 0$ for z and express your answers in rectangular form.
    A. $1 \pm 2i$
    B. $1 \pm 3i$
    C. $1 \pm \sqrt{5}i$
    D. $1 \pm 2i^2$
19. If $z = 2 + i$ is one root of a quadratic equation $x^2 + bx + c$ with real coefficients, what is bc?
    A. -20
    B. -10
    C. 4
    D. 8
20. If $z^4 = 16e^{2\pi i/5}$, find all values of z in polar form.
    A. $z = 2e^{\pi i/10}, 2e^{3\pi i/5}, 2e^{11\pi i/10}, 2e^{8\pi i/5}$
    B. $z = 2, 2e^{\pi i/2}, 2e^{\pi i}, 2e^{3\pi i/2}$
    C. $z = 2e^{\pi i/10}, 2e^{3\pi i/10}, 2e^{5\pi i/10}, 2e^{7\pi i/10}$
    D. $z = 2e^{2\pi i/5}, 2e^{4\pi i/5}, 2e^{6\pi i/5}, 2e^{8\pi i/5}$
21. Factor $z^2 + 9$ into a product of two binomials.
    A. $(z + 3i)(z - 3i)$
    B. $(z + 3)(z - 3)$
    C. $(z + 3i)(z + 3i)$
    D. $(z + 3\sqrt{i})(z - 3\sqrt{i})$

22. (Bonus): By multiplying two complex numbers, prove the addition identities for sin and cos.