1. Consider the parametric equations: $\begin{array}{l} x=(t+3)^2 \\ y=t+7 \end{array}$ for $-10 \le t \le 10$. Eliminate the parameter. Describe the curve and indicate the positive orientation by stating the starting ordered pair and the ending ordered pair.
2. Consider the parametric equations: $\begin{array}{l} x=6\cos t \\ y=6\sin t \end{array}$ for $\pi \le t \le 2\pi$. Eliminate the parameter. Describe the curve and indicate the positive orientation by stating the starting ordered pair and the ending ordered pair.
3. Find parametric equations for the complete curve $x=-4y^3-y$, include the interval for the parameter.
4. Find parametric equations for the line segment that moves from $(-4,-2)$ to $(2,4)$, include the interval for the parameter.
5. Find $\frac{dy}{dx}$ for the parametric curve $\begin{array}{l} x=3t \\ y=t^5 \end{array}$ then evaluate $\frac{dy}{dx}$ at $t=2$.
6. Find the equation of the tangent line to the curve given by $\begin{array}{l} x=\cos t+t\sin t \\ y=\sin t-t\cos t \end{array}$ at $t=\frac{3\pi}{4}$.
7. Find the arc length of the curve given by $\begin{array}{l} x=2t^3 \\ y=3t^2 \end{array}$ where $0 \le t \le \sqrt{8}$.
8. Name two other ordered pairs, one with a positive r and one with a negative r that represents the same point as $\left(-3,-\frac{\pi}{3}\right)$.
9. Write the polar point $\left(-2,\frac{-11\pi}{6}\right)$ in Cartesian coordinates.
10. Write the Cartesian point $(5\sqrt{3},5)$ in polar form with $0 \le \theta \le 2\pi$.
11. Find $\frac{dy}{dx}$ for the polar curve $r=7-7\sin\theta$. Then evaluate the derivative at the point $\left(14,\frac{3\pi}{2}\right)$.
12. Find $\frac{dy}{dx}$ and the points at which the polar curve $r=3\cos\theta$ has a vertical or horizontal tangent line.
13. Find the area inside one leaf of $r=5\cos 3\theta$.
14. Given the polar equations $r=16+16\sin\theta$ and $r=16+16\cos\theta$ find all points of intersection and the area that lies inside both curves (not just the overlapping portion).
15. Find the area of the region outside $r=3$ and inside $r=-6\cos\theta$.

16. Find the length of the curve $r=\dfrac{20}{1+\cos\theta}$ on the interval $0\le\theta\le\dfrac{\pi}{2}$.
17. Given the equation of the ellipse $5x^2+7y^2=35$, write in standard form then find the coordinates of the foci and the length of both the major and minor axis.
18. Find an equation of the hyperbola with foci $(-13,0)$ and $(13,0)$; and vertices at $(12,0)$ and $(-12,0)$.
19. Find the equation of the tangent line to the curve $y^2-\dfrac{x^2}{64}=1$ at the point $\left(6,\dfrac{5}{4}\right)$.
20. Given the points $Q(-5,1), T(3,2), P(-2,-3), U(6,-2), R(0,-1),$ and $S(-4,-4)$ find the vectors $\overrightarrow{QT}, \overrightarrow{PU},$ and $\overrightarrow{RS}$. Are any of these vectors equal?
21. Find a vector in the direction of $\langle 6,-8\rangle$ that has a magnitude of 4.
22. An airplane flies horizontally from east to west at 282 mph relative to the air. If is flies in a steady 38mph wind that blows horizontally toward the southwest (45° south of west), find the speed and direction of the airplane relative to the ground.
23. Suppose you are pulling a suitcase with a strap that makes a 30° angle with the horizontal. The magnitude of the force you exert on the suitcase is 24 lb. Find the horizonal and vertical components of the force.
24. Find the equation of the sphere that passes through $P(-8,7,8)$ and $Q(2,-1,7)$ with its center at the midpoint of PQ .
25. Find the center and radius of the sphere $x^2+y^2+z^2-14x+6y-10z+58=0$.
26. Given the vectors $\mathbf{u}=\langle 5,3,7\sqrt{3}\rangle$ and $\mathbf{v}=\langle 1,0,8\sqrt{3}\rangle$ find the following: $4\mathbf{u}+2\mathbf{v}$, $3\mathbf{u}-\mathbf{v}$, and $|\mathbf{u}+3\mathbf{v}|$.
27. Find two vectors parallel to the vector **v** with a length of 42. $\mathbf{v}=\overrightarrow{PQ}$ with $P(5,5,3)$ and $Q(4,1,8)$.
28. Given $\mathbf{u}=\mathbf{i}-2\mathbf{j}+3\mathbf{k}$ and $\mathbf{v}=3\mathbf{i}+\mathbf{j}+4\mathbf{k}$,find $\mathbf{u}\bullet\mathbf{v}$ and the angle between the vectors.
29. Given the vectors $\mathbf{u}=\langle -7,0,4\rangle$ and $\mathbf{v}=\langle 1,2,-2\rangle$ find $\text{proj}_{\mathbf{v}}\mathbf{u}$.
30. Find the value of c so that the vectors $\langle 2,-3,c\rangle$ and $\langle 1,-4,-3\rangle$ are orthogonal.
31. Find a vector normal to the vectors $\langle 7,0,4\rangle$ and $\langle -8,3,2\rangle$.

32. Find both the vector equation and the parametric equations of the line through $(-3,1,4)$ and $(4,-2,0)$, let $t=0$ correspond to the first point.
33. Determine if the lines $\mathbf{r}_1 = \langle 1,4,3\rangle + t\langle 7,-5,-3\rangle$ and $\mathbf{r}_2 = \langle 7,6,15\rangle + s\langle 3,1,6\rangle$ are parallel, intersect at a single point, or are skew. If they are parallel determine if they are the same line (intersecting at every point). If the lines intersect at a single point, find the point.
34. Determine if the lines $x=2,\ y=6-t,\quad z=1+t$ and $x=-2-4s,\ y=1+5s,\quad z=4-s$ are parallel, intersect at a single point, or are skew. If they are parallel determine if they are the same line (intersecting at every point). If the lines intersect at a single point, find the point.
35. Use the fact that $d=\dfrac{\left|\mathbf{v}\times\overrightarrow{PQ}\right|}{\mathbf{v}}$ to find the distance from the point $(2,-1,1)$ to the line $x=-1-t,\ y=1-2t,\quad z=-6+3t$.
36. Find the equation of the plane parallel to the vectors $\langle 2,0,3\rangle$ and $\langle 0,3,3\rangle$ passing through the point $(3,0,-1)$.
37. Determine if the planes $4x+4y+2z=23$ and $-4x-3y+14z=23$ are parallel, orthogonal or neither.
38. Find the equation of the line where the planes $2x-3y+z=1$ and $x+y+z=0$ intersect, if it exists.
39. Find the point, if it exists, at which the plane $y=-8$ and the line $\mathbf{r}=\langle 4t+1,-t+5,t-6\rangle$ intersect.
40. Find the smallest angle between the planes $7x+4y-z=0$ and $-5x+2y+2z=0$.
41. Consider the equation of the quadric surface $\dfrac{y^2}{36}+100z^2-\dfrac{x^2}{25}=4$. Find the equations of the xy-, xz-, and yz-traces. Identify the surface.
42. Write the equation $-x^2-y^2+\dfrac{z^2}{4}+8x-6y=29$ in standard form of one of the quadric surfaces. Identify the surface and it's center.