1. What is the slope of the line with parametric equations \( x = 2t + 3 \), \( y = 7t - 2 \)?

2. Given the points \( P(4, -4) \) and \( Q(5, -2) \):
   a.) Find parametric equations for the line passing through \( P \) and \( Q \).
   b.) Find a unit vector in the direction of the vector starting at \( P \) and ending at \( Q \).

3. Find parametric equations of the line passing through \((-1, 1)\) and perpendicular to the line \( x = 4 - 3t \), \( y = 5 + t \).

4. Find the work done by a force of 20 Newtons acting in the direction \( N30^\circ W \) in moving an object 4 meters due west.

5. The points \( A(-1, 2) \), \( B(2, 1) \), and \( C(0, 5) \) form a triangle. Find angle \( C \).

6. Which of the following statements is true about the curve \((2 + \cos t)i + (1 + \sin t)j\)?
   a) Clockwise movement around the circle \((x - 2)^2 + (y - 1)^2 = 1\)
   b) Counterclockwise movement around the circle \((x - 2)^2 + (y - 1)^2 = 1\)
   c) Clockwise movement around the ellipse \(x^2/4 + y^2 = 1\)
   d) Counterclockwise movement around the ellipse \(x^2/4 + y^2 = 1\)
   e) None of the above statements is correct.

7. If two forces given by \( \mathbf{F}_1 = \langle 1, 5 \rangle \) and \( \mathbf{F}_2 = \langle 4, 1 \rangle \) are acting on an object sitting at the origin, find the resultant force as well as its magnitude and direction. Measure the direction of the resultant force from the positive \( x \)-axis.

8. Find the vector projection and the scalar projection of \( \langle 1, 4 \rangle \) onto \( \langle 8, 3 \rangle \).

9. Find the distance from the point \((2, 3)\) to the line \( y = 4x + 5 \).

10. Evaluate \( \sin \left( 2 \arccos \left( -\frac{4}{5} \right) \right) \)

11. Express \( \tan(\arcsin x) \) as an algebraic expression.

12. Find all vertical and horizontal asymptotes for the curve \( f(x) = \frac{x - 2}{x^2 - 4} \).

13. Use the limit definition to find the derivative, \( f'(x) \), of \( f(x) = \sqrt{2 - 3x} \). No points will be awarded for not using the limit definition of the derivative.
14. Find the limit or prove it does not exist. Do not use L’Hospitals Rule.

(a) \( \lim_{x \to 4} \frac{2x^2 - 32}{x - 4} \)

(b) \( \lim_{x \to 3} \frac{1}{x + 4} - \frac{1}{7} \)

(c) \( \lim_{x \to 1} \frac{x + 1}{(x - 1)^3} \)

(d) \( \lim_{x \to 0^-} \frac{x^2 - 2x}{|x|} \)

(e) \( \lim_{x \to \infty} \frac{6x^2 - x - 3}{2 + 3x - 3x^2} \)

(f) \( \lim_{x \to \infty} \frac{\sqrt{10x^2 - 5}}{2 - 3x} \) and \( \lim_{x \to -\infty} \frac{\sqrt{10x^2 - 5}}{2 - 3x} \)

(g) \( \lim_{x \to \infty} e^{1-x} \)

(h) \( \lim_{x \to 4^-} \left( \frac{1}{e} \right)^{x/(x-4)} \)

(i) \( \lim_{x \to \infty} [\log(2x^2 - 1) - \log(3x^2 + 6)] \)

15. Find values of \( a \) and \( b \) which make \( f(x) \) continuous for all \( x \), if possible. If not possible, explain why.

\[
f(x) = \begin{cases} 
\frac{x^2 - 1}{x - 1} & \text{if } x < 1 \\
ax^2 - bx + 3 & \text{if } 1 \leq x < 2 \\
2x - a + b & \text{if } x \geq 2 
\end{cases}
\]

16. According to the Intermediate Value Theorem, the equation \( x^3 - 2x^2 + x = -5 \) has a solution in which of the following intervals?

a) \([ -3, -2 ]\)

b) \([2, 3]\)

c) \([ -2, -1 ]\)

d) \([-1, 0]\)

e) \([0, 1]\)
17. If \( f(x) = \begin{cases} \frac{5}{6}x & \text{if } x < 5 \\ 3 & \text{if } 5 < x < 8 \\ 9 - x & \text{if } x > 8 \end{cases} \), determine which of the following statements is true.

a) \( f \) is continuous at \( x = 5 \)

b) \( \lim_{x \to 5} f(x) \) does not exist.

c) \( \lim_{x \to 8^+} f(x) = 3 \)

d) \( \lim_{x \to 5^-} f(x) = 3 \)

e) \( f \) is continuous for all values of \( x \).

18. **Definition:** Let \( f(x) \) be a function. We say \( f(x) \) is **differentiable** at \( x = a \) if \( f'(a) \) exists. The graphs below illustrate where \( f \) can fail to be differentiable.

![Graphs showing different types of discontinuities](image)

(a) A corner  
(b) A discontinuity  
(c) A vertical tangent

19. What does the graph of \( f(x) \) tell us about the graph of \( f'(x) \)? Recall that \( f'(a) \) measures the slope of \( f(x) \) at \( x = a \), provided that \( f(x) \) is differentiable at \( x = a \). Therefore, if we are given the graph of \( f(x) \), we can do a rough sketch of \( f'(x) \) by measuring slopes of \( f(x) \) along the curve.