

**Problems:**

- Given  $\vec{a} = \langle 2, 5 \rangle$  and  $\vec{b} = \langle -1, 2 \rangle$ . Find  $|2\vec{a} + 3\vec{b}|$ .
- Given two points  $A(1, -2)$  and  $B(-4, 10)$ . Find a vector of length 2 in the direction of the vector  $\vec{AB}$ .
- Find the work done.
  - Given a force  $\vec{F} = \langle 1, 5 \rangle$  moving an object from  $P(1, 0)$  to  $Q(7, 4)$ .
  - Given a force of magnitude 5 N. It applies to a moving object in a direction of  $60^\circ$ . The object moved 3 m.
- Given  $A(0, 1)$ ,  $B(2, 0)$ , and  $C(3, -4)$ . Find the angle  $\angle ABC$ .
- Given  $\vec{a} = \langle 2, 5 \rangle$  and  $\vec{b} = \langle -1, 2 \rangle$ . Find the scalar projection from  $\vec{a}$  onto  $\vec{b}$ .
- Find a parametric equation.
  - The line passing through the point  $(1, -3)$  that is perpendicular to the direction  $\langle 3, -4 \rangle$ .
  - The circle with clockwise orientation of radius 3 centered at  $(5, -2)$ .
- Simplify  $\csc(\arctan(x))$ .
- Find the limits.

(a)

$$\lim_{x \rightarrow -4} \frac{x+3}{(x+4)^2}$$

(b)

$$\lim_{x \rightarrow 2^-} \frac{x+1}{x^2+2x-8}$$

(c)

$$\lim_{x \rightarrow 1^-} \frac{x^2+3x-4}{|x-1|}$$

(d)

$$\lim_{x \rightarrow -\infty} \frac{5-4x}{\sqrt{9x^2+2x}}$$

(e)

$$\lim_{x \rightarrow -\infty} \frac{2e^x - 5e^{-x}}{3e^x + 8e^{-x}}$$

(f)

$$\lim_{x \rightarrow \infty} \ln(3x^2+4) - \ln(4x^3+1)$$

- Find the horizontal and vertical asymptotes for

$$f(x) = \frac{2x^2 + 7x + 3}{x^2 - 9}$$

- Show that the interval  $(0, 1)$  contains a solution to the equation  $2x^3 + 16x + 3 = 18$ .
- Evaluate the limits.

(a)

$$\lim_{x \rightarrow 4} \frac{x^2 - 3x - 4}{x^2 - 2x - 8}$$



(b)

$$\lim_{x \rightarrow 5} \frac{\sqrt{x+4} - 3}{x - 5}$$

(c)

$$\lim_{x \rightarrow 0} x^6 \cos\left(\frac{4}{x}\right)$$

12. Given

$$f(x) = \begin{cases} x^2 - 5a & \text{if } x < -1 \\ ax^2 & \text{if } -1 \leq x \leq 2 \\ 3ax + b & \text{if } x > 2 \end{cases} .$$

Find values for  $a$  and  $b$  that make the function continuous everywhere.13. Find the derivative of  $f(x) = \frac{1}{3x+4}$  by using the definition.