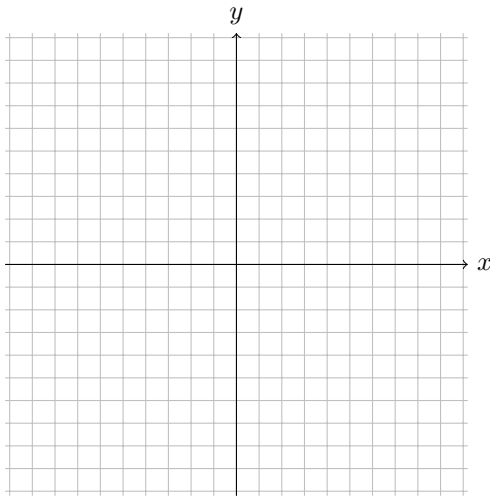


## Review for Exam 1

### 1 Chapter 1

#### Exercise 1.

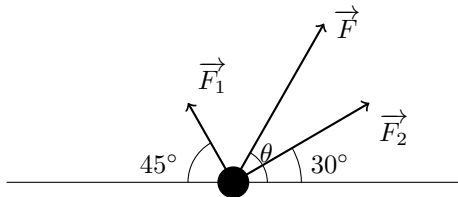
1. Draw the vectors  $\vec{a} = \langle 2, 3 \rangle$ ,  $\vec{b} = \langle -1, 2 \rangle$ , and  $\vec{c} = \langle 7, 0 \rangle$ .



2. Find the magnitude of  $\vec{a}$ .
3. Find a unit vector in the opposite direction as  $\vec{b}$ .
4. Find a unit vector orthogonal to  $\vec{b}$ .
5. Find  $s$  and  $t$  such that  $\vec{c} = s\vec{a} + t\vec{b}$ .

**Exercise 2.** Two forces  $\vec{F}_1$  and  $\vec{F}_2$  with magnitude 6N and 8N acts on an object at a point  $P$  as shown in figure below.

Find the resulting force  $\vec{F}$  acting at  $P$  as well as its magnitude and its direction (indicate the direction by finding the angle  $\theta$ , shown in the picture).



**Exercise 3.** Find the value(s) of  $x$  such that  $\langle x, x + 1 \rangle$  and  $\langle x, 4 \rangle$  are orthogonal.

**Exercise 4.** Find the scalar projection and the vector projection of  $\vec{b} = \langle 3, 3 \rangle$  onto  $\vec{a} = \langle 2, -1 \rangle$ .

**Exercise 5.** Find the work done by a force of 20lb acting in the direction N30°W in moving an object 6ft due west.

**Exercise 6.** Given the parametric curve

$$x(t) = \frac{1-t}{1+t}, \quad y(t) = t^2.$$

Find a Cartesian equation of the curve.

**Exercise 7.** Find a vector equation, a parametric equation a Cartesian equation of the line passing through the point (2, 3) and parallel to  $\vec{v} = \langle -1, 4 \rangle$ .

**Exercise 8.** Find a vector equation, a parametric equation, a Cartesian equation of the line passing through A(1, 3) and B(4, -2).

**Exercise 9.** Let  $L_1$  and  $L_2$  be the lines determined by the vector equations

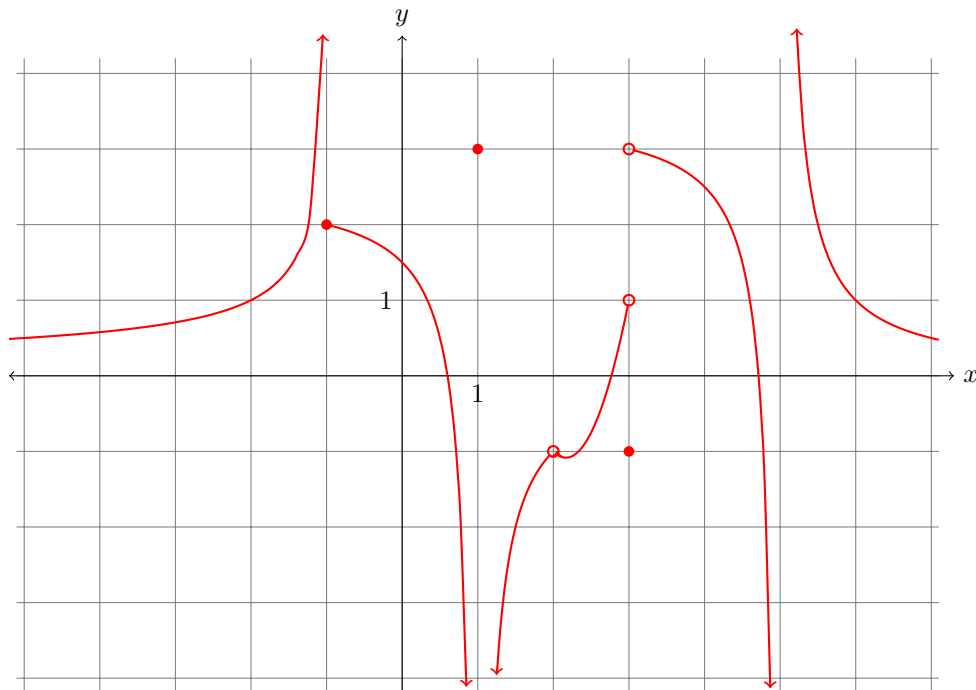
$$L_1 : \vec{r}_1(t) = \langle 8 + 3t, 10 + 4t \rangle$$

$$L_2 : \vec{r}_2(t) = \langle 3 + 8t, -5 - 6t \rangle$$

1. Does the line  $L_1$  passes through the point (14, 18)? Does the line  $L_2$  passes through the point (14, 18)?
2. Are the line orthogonal, parallel or neither?
3. In case the lines are not parallel, find the point of intersection

## 2 Chapter 2

**Exercise 10.**



Find the values of the function, the one side limits and the limits at  $x = -1$ ,  $x = 1$ ,  $x = 2$ , and  $x = 5$ .

**Exercise 11.** Find and classify all the points of discontinuity for the function

$$f(x) = \begin{cases} 2x + 1 & \text{for } x \leq 1 \\ \sqrt{3x^2 + x + 5} & \text{for } 1 < x \leq 2 \\ 4x + 5 & \text{for } 2 < x \end{cases}$$

**Exercise 12.** Find the limit of  $\vec{r}(t) = (3t^2 - 1)\mathbf{i} + \left(\frac{t^2 - 1}{t + 1}\right)\mathbf{j}$  at  $t = 1$ .

**Exercise 13.** Find the limit

$$\lim_{x \rightarrow 0} x^2 \sin\left(\frac{1}{x}\right) + 3$$

**Exercise 14.** Find the vertical and horizontal asymptotes of

$$f(x) = \frac{(x - 3)(x^2 - 1)}{x^3 - 2x^2 - 3x}.$$

**Exercise 15.** Determine whether the following function have horizontal asymptote. If they do, give an equation of the asymptote.

1.  $f(x) = \frac{(3x^2 - 5x + 1)}{x^3 - 2x^2 - 3x}$

2.  $f(x) = \frac{x^2 + 5x^5 + 7x^2 - 3}{x^2 - 3x^3 + 2x^4 + 9x^5}$ .

3.  $f(x) = \frac{3x^3 + 6x - 8}{7x^2 + 3x - 2}$ .

4.  $f(x) = \sqrt{(x^2 + 10x - 3)} - \sqrt{(x^2 - 8x + 5)}$ .

5.  $f(x) = \sqrt{(x^2 + 3x - 8)} + x$ .

**Exercise 16.** At which point is the function  $f(x) = \frac{|x^2 - 5x + 4|}{x - 1}$  not continuous?

**Exercise 17.** Does the function  $f(x) = \frac{\sqrt{7 - 3x} - 1}{\sqrt{6 - x} - 2}$  have a removable discontinuity at  $x = 2$ ?

**Exercise 18.** Determine the value of  $a$  such that the function

$$f(x) = \begin{cases} x^2 + ax - 3 & \text{for } x < 2 \\ 5x + a & \text{for } x \geq 2 \end{cases}$$

is continuous at  $x = 2$ .

### 3 Section 2.7-3.1

**Exercise 19.** Use the limit definition of the derivative to find the derivative

1.  $f(x) = x^3 - 5x^2 + 2$  at  $x = a$ .

2.  $f(x) = \frac{2x + 1}{x - 5}$  at  $x = 2$ .

Find an equation of the tangent line to the graph of  $f$  at  $x = 2$ .

3.  $f(x) = \frac{7}{\sqrt{2x-1}}$  at  $x = 5$

**Exercise 20.** At which point(s) is the function  $|x^2 - 9|$  not differentiable.

**Exercise 21.** Using the definition of the derivative, find the tangent vector to the curve

$$\vec{r}(t) = \langle t^2 + t, \sqrt{3t} \rangle$$

at  $(4, 3)$ .