4.8B Vectors

Write your questions and thoughts here!

Unit Vector: a vector that has a magnitude of 1.

$$\frac{\mathbf{v}}{\|\mathbf{v}\|}$$

Ex 1: Find the unit vector for $< 3, 5 >$.

Dot Product for Vectors

$$< a_1, b_1 > \cdot < a_2, b_2 > = a_1 \cdot a_2 + b_1 \cdot b_2$$

or

$$\|\mathbf{a}\| \cdot \|\mathbf{b}\| \cdot cos\theta$$

The result is a scalar of the two vectors but we can use it to find the angle between the two vectors.

Ex 2: $< -3, 4 >$ and $< 2, 6 >$. Find the angle between the two vectors.

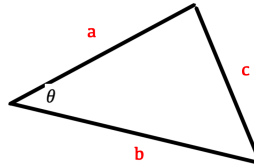Ex 3: Try this one! Find the angle between the two vectors. $< 5, -3 >$ and $< 6, 10 >$.

When two vectors are perpendicular we call them ORTHOGONAL.

Law of Cosines

When we have two vectors and the angle between them and want to find the magnitude between them.

$$c^2 = a^2 + b^2 - 2ab \cdot \cos C$$

Law of Sines

When we have two vectors and two angles opposite those vectors.

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

Ex 4: A plane leaves the airport heading 20° south of east at 600 mph. A wind is blowing in the direction 40° north of east at 25 mph.

Find the actual speed (ground speed) and direction of the airplane.

4.8B Vectors
AP Precalculus

4.8B Practice

Instructions: Find the unit vector for the given vector.

1) < 3, 4 >	2) <10, -4 >	3) < -5, 8 >

Instructions: Find the dot product for the following vectors.

4) < 2, 4 > and < 3, 9>	5) < -4, 8 > and < -3, -8 >	6) < 5, 2 > and < 4, 10 >

Instructions: Find the angle between the two vectors.

7) < -3, -5 > and < -15, 9 >	8) < 2, 4 > and < -1, 8 >	9) < 5, -1 > and < 4, 6 >

Instructions: Use the Law of Sines and Cosines to solve the following.

10) A river flows directly north with a current that is 8 mph. A ferry boat leaves the west edge of the river and heads $25°$ north of east at a speed of 20 mph. What is the actual speed and direction of the boat?

11) An airplane takes off in the direction of $30°$ north of west at a speed of 400 mph. The wind current is blowing at $20°$ east of north at a speed of 25 mph. What is the ground speed and direction of the plane?

12. (1.7A) Given $f(x) = x^2 + a^2$ and $g(x) = x^2 - a^2$ where a is a constant integer. The function $r(x) = \frac{f(x)}{g(x)}$. What is the domain of $r(x)$?

    (A) $(-\infty, -a) \cup (a, \infty)$

    (B) $(-a, a)$

    (C) $(-\infty, -a) \cup (-a, a) \cup (a, \infty)$

    (D) $(-\infty, -a)$

    (E) (a, ∞)

13. (1.7B) The function f is given by $f(x) = \frac{ax^3 - 2x^2 + 5}{2x^3 - 8}$ and has line $y = 3$ as a horizontal asymptote. Which of the following must be true?

    (A) $f(a) = 6$

    (B) $a = 6$

    (C) $\lim_{x \to \infty} f(x) = a$

    (D) $\lim_{x \to \infty} f(x) = 6$

    (E) None of the above are true.

14. (1.8) The function f is given by $f(x) = \frac{x^2 + 2x - 24}{4 - x}$. Which of the following describes the function f ?

    (A) The graph of f has an x-intercept at $x = -6$ and a vertical asymptote of $x = 4$.

    (B) The graph of f has an x-intercept at $x = -6$ and a hole at $x = 4$.

    (C) The graph of f has an x-intercept at $x = -6$ and a vertical asymptote of $x = -4$.

    (D) The graph of f has an x-intercept at $x = -6$ and a hole at $x = -4$.

    (E) The graph of f has x-intercepts at $x = -6$ and $x = 4$.