MITx 18.02.1x
Multivariable Calculus 1: Vectors and Derivatives

Help   sandipan_dey ⌄

Course   Progress   Dates   Calendar   Discussion   Notes

🏠 Course / Unit 2: Geometry of Derivati... / Lecture 5: Finding vectors normal to level cur...   🕐

You are taking "Exam (Timed, No Correctness Feedback)" as a timed exam. Show more

End My Exam   44:13:36   🚫

⟨ Previous   📗✓ 📹✓ 📝✓ 📹✓ 📹✓ 📹✓ 📝✓ 📹✓ 📹✓ 📹✓ 📝✓ 📝✓ 📗✓ Next ⟩

3. Warmup problem

🔖 Bookmark this page

Calculator   ✏️ Hide Notes

Lecture due Aug 18, 2021 20:30 IST   Completed

Practice

The dot product is?

1/1 point (graded)
The dot product of two vectors is

- 🔘 a number
- ⚪ a vector
- ⚪ a matrix
- ⚪ none of the above

✔️

Solution:

The dot product of two vectors $\langle a, b \rangle$ and $\langle x, y \rangle$ is a number, which is the sum of the component-wise products

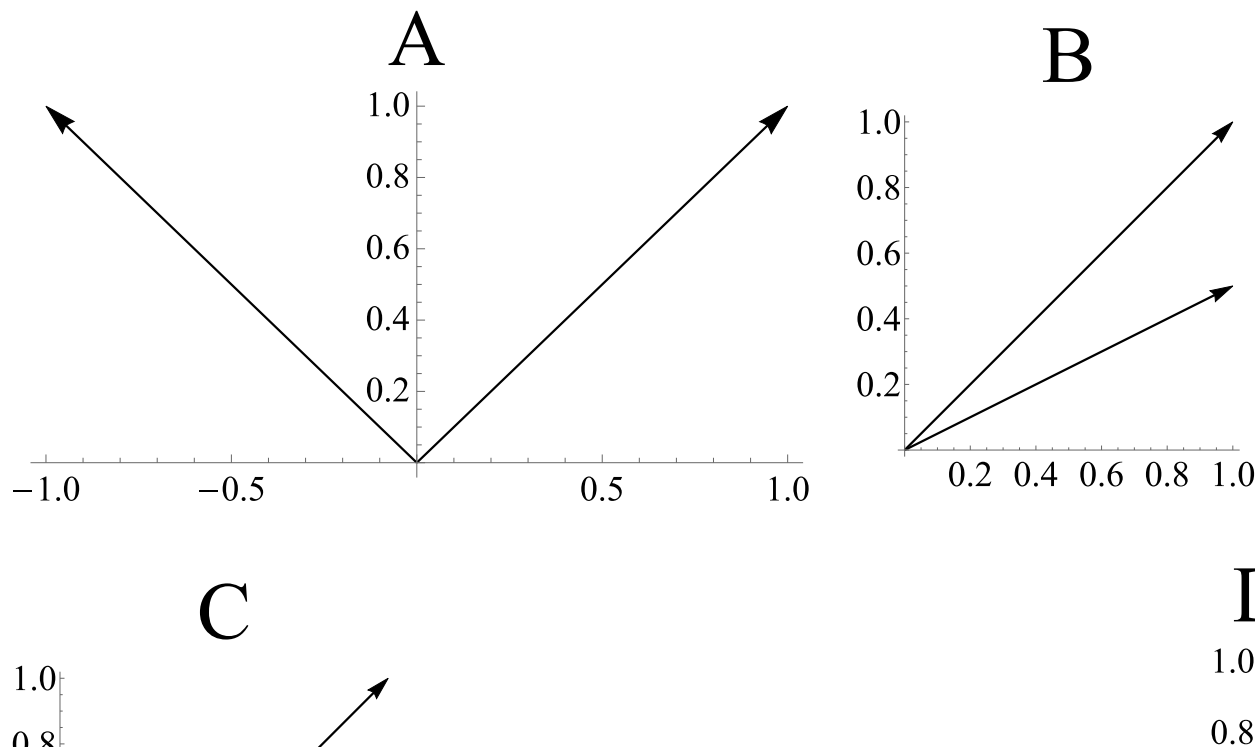$$\langle a, b \rangle \cdot \langle x, y \rangle = ax + by.$$
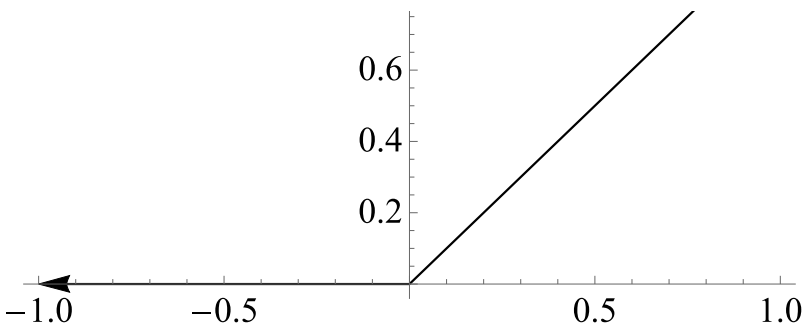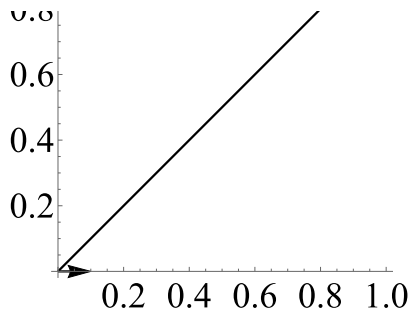
| Submit | You have used 1 of 2 attempts |

ℹ️ Answers are displayed within the problem

Order the dot products

4/4 points (graded)
Consider the dot product of each of the following pairs of vectors. Put the dot products in order from smallest to largest.

(Hint: negative numbers are smaller than zero.)

(Enter the letter A,B,C, and D in the order such that the dot products of the vectors pictured go in order from least to greatest.)

D		A		C		B
✔ **Answer:** D	<	✔ **Answer:** A	<	✔ **Answer:** C	<	✔ **Answer:** B

Solution:

When two vectors $\vec{v}$ and $\vec{w}$ are separated by an angle θ when drawn from the same point, their dot product is given by

$$\vec{v} \cdot \vec{w} = |\vec{v}||\vec{w}| \cos(\theta).$$

Note that $|\vec{v}|$ and $|\vec{w}|$ are both greater than 0.

Let us use this definition to understand the relative sizes of the dot products of the vectors pictured.

- The dot product of the first two vectors is zero because they are orthogonal, and so $\theta = \pi/2$ and $\cos(\theta) = 0$.

- The dot product of the second two vectors is a positive number because they are separated by an angle $\theta < \pi/2$ and $\cos(\theta) > 0$. Therefore the dot product is positive.

- The dot product of the third pair of vectors is positive but small because they are separated by a small acute angle, so $\cos(\theta) > 0$, but one of the vectors is small in length. This dot product is a positive number that is smaller than the previous dot product.

- The dot product of the fourth pair of vectors is negative because the vectors are separated by an angle $\theta > \pi/2$, so $\cos(\theta) < 0$. Therefore these two vectors have the smallest dot product.

Therefore the order of the dot products from smallest to largest is:

$$D < A < C < B.$$

Submit   You have used 1 of 3 attempts

ⓘ   Answers are displayed within the problem

3. Warmup problem

Hide Discussion

Topic: Unit 2: Geometry of Derivatives / 3. Warmup problem

Add a Post

Show all posts ▾   by recent activity ▾

[Staff] Lower Case Letters are Marked Incorrect

< Previous   Next >

📊 Calculator   ✏ Hide Notes

edX

About

Affiliates

edX for Business

Open edX

Careers

News

Legal

Terms of Service & Honor Code

Privacy Policy

Accessibility Policy

Trademark Policy

Sitemap

Connect

Blog

Contact Us

Help Center

Media Kit

Donate

Calculator   Hide Notes