

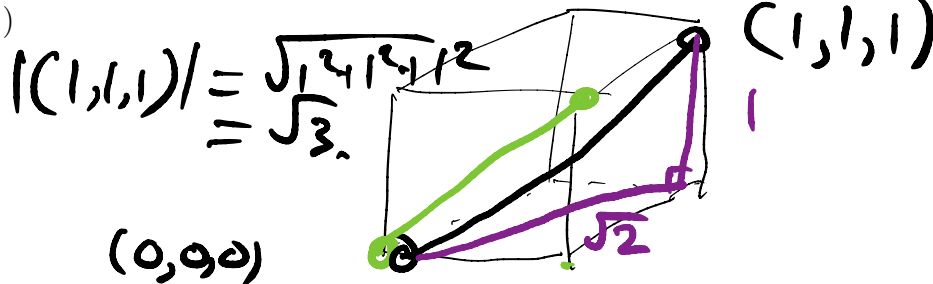
Name:

Each of the multiple choice question below has one correct choice. Circle the correct choice.

Q1

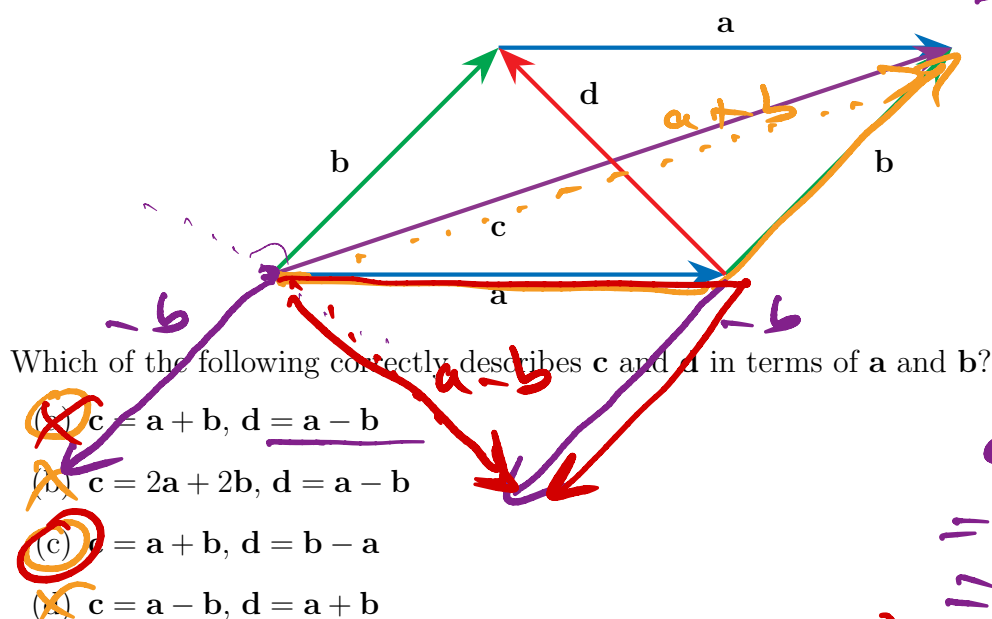
A cube has side length 1. What is the maximum possible distance between any two points on the cube? (Hint: construct a vector from a corner of the cube to its opposite corner, then calculate its length.)

- (a) 1
~~(b) $\sqrt{2}$~~
 (c) $\sqrt{3}$
 (d) 2



Q2

Several vectors are plotted below.



$$c^2 = 1^2 + (\sqrt{2})^2 = 1 + 2 = 3$$

$$c = \sqrt{3}$$

$a+b$

$$a-b = a + (-b)$$

$$= a - b$$

$$-(a-b) = b-a$$

Q3

Assume a feral rabbit population at a farm in Australia is modeled by the logistic equation

$$X' = 30X - 0.03X^2$$

Which of the following is predicted by the model?

- (a) ~~When $X = 30$, the rabbit population will be decreasing.~~
 (b) ~~When $X = 700$, the rabbit population will be decreasing.~~
 (c) $\text{When } X = 900, \text{ the rabbit population will be increasing.}$
 (d) ~~When $X = 1100$, the rabbit population will be increasing.~~

$$X' = bX - cX^2$$

$$(b=30, c=0.03)$$

$$X' = bX(1 - \frac{X}{k})$$

$$(k=1000 \rightarrow)$$

$k > X$: population decreases
 $k < X$: " increases

$$X' = bX - cX^2$$

$$(b=30, c=0.03)$$

$$X' = bX \left(1 - \frac{X}{k}\right)$$

$$= c(y+z)$$

$$= xy + xz$$

$$= bX \cdot 1 + bX \cdot \left(-\frac{X}{k}\right)$$

$$= bX - \frac{b}{k}X^2$$

$$c = \frac{b}{k} \rightarrow k = \frac{b}{c} = \frac{30}{0.03} = 1000.$$

Q4

Which of the following is a differential equation for the following verbal statement: the yearly rate of change of a population is the sum of births, deaths and immigration, with per capita birth rate 2.5, per capita death rate 2.2, and in immigration rate of 10 000 individuals per year.

~~(a)~~ $P' = 2.5P + 2.2P + 10000P$

~~(b)~~ $P' = 2.5P - 2.2P + 10000P$

☒ (c) $P' = 2.5P - 2.2P + 10000$

(d) $P' = 2.5P - 2.2P - 10000$

$$\begin{array}{l} + 2.5P \\ - 2.2P \\ + 10\,000 \end{array}$$

Q5

Based on content covered this week... to be determined.