

## FALL - 2024 - CALCULUS 3 - EXAM 1A

Vectors are in boldface.  $|\cdot|$  is the norm or length of a vector

NO REFERENCES

True or false:

- 1) Every vector in  $\mathbb{R}^3$  corresponds to a unique line segment
- 2) A line segment is uniquely determined by its magnitude and direction
- 3) Two vectors can be added using the parallelogram law
- 4) Vectors may be multiplied together in three ways
- 5) There is an angle where the dot product and cross product of two vectors are equal
- 6) The length of vector  $\langle a, b, c \rangle$  is  $\sqrt{a + b + c}$
- 7)  $|(\mathbf{A} \times \mathbf{B}) \cdot \mathbf{C}| = |(\mathbf{B} \times \mathbf{C}) \cdot \mathbf{A}|$
- 8) There is a vector perpendicular to every vector in  $\mathbb{R}^3$
- 9)  $\mathbf{A} \times \mathbf{B}$  is perpendicular to  $\mathbf{B}$  but not  $\mathbf{A}$
- 10)  $|\mathbf{A} \times \mathbf{B}| = |\mathbf{A}||\mathbf{B}|\sin\theta$
- 11) The norm of a vector is always greater than zero
- 12) A parallelogram with adjacent sides  $\mathbf{A}$  and  $\mathbf{B}$  has area  $(\mathbf{A} \times \mathbf{B})$
- 13) Perpendicular vectors have zero dot product
- 14) Antiparallel vectors have zero cross product
- 15) A plane is determined by a point on the plane and a vector in the plane
- 16) The equation of a plane thru the point  $\mathbf{r}_0$  perpendicular to  $\mathbf{v}$  is  $(\mathbf{r} - \mathbf{r}_0) \cdot \mathbf{v} = 0$
- 17) There are infinitely many planes perpendicular to a fixed direction vector
- 18) The graph of  $-\frac{x^2}{4} + \frac{y^2}{9} - \frac{z^2}{25} = 1$  consists of one sheet
- 19) The angle between two planes is the same as the angle between lines parallel to each plane
- 20) A force vector  $\langle 1, 2, 1 \rangle N$  acting through a displacement vector  $\langle 1, -2, 3 \rangle m$  results in  $8J$
- 21) The points  $(1, -2, 4)$ ,  $(-2, 4, -8)$ , and  $(0, 0, 0)$  determine a plane
- 22)  $\mathbf{A} \times (\mathbf{B} \times \mathbf{C}) = (\mathbf{A} \times \mathbf{B}) \times \mathbf{C}$
- 23)  $c\mathbf{A} \times \mathbf{B} = \mathbf{A} \times c\mathbf{B}$  for constant  $c$
- 24)  $\mathbf{A} \times (\mathbf{B} \times \mathbf{A}) = \mathbf{0}$  always
- 25) No matter how many forces are acting on a point in  $\mathbb{R}^3$ , they can be perfectly counterbalanced by one additional force