

Math 126 - Spring 2018

Exam 1

April 19, 2018

Name: _____

Section: _____

Student ID Number: _____

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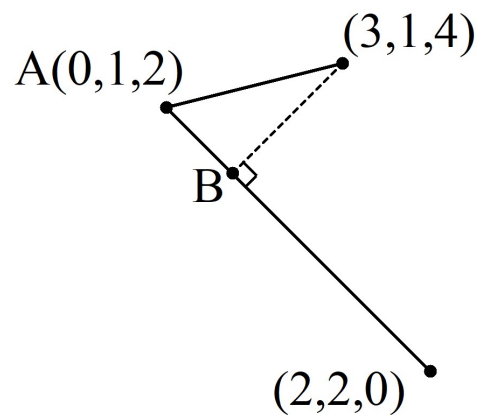
- There are 4 pages of questions. Make sure your exam contains all these questions.
- You are allowed to use a Ti-30x IIS Calculator model ONLY (**no other calculators allowed**). And you are allowed one **hand-written** 8.5 by 11 inch page of notes (front and back).
- Leave your answer in exact form. Simplify standard trig, inverse trig, natural logarithm, and root values. Here are several examples: you should write $\sqrt{4} = 2$ and $\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$ and $\frac{7}{2} - \frac{3}{5} = \frac{29}{10}$ and $\ln(1) = 0$ and $\tan^{-1}(1) = \frac{\pi}{4}$.
- Show your work on all problems. The correct answer with no supporting work may result in no credit. **Put a box around your FINAL ANSWER for each problem and cross out any work that you don't want to be graded.**
- If you need more room, use backs of the pages and indicate to the grader that you have done so.
- Raise your hand if you have a question.
- There may be **multiple versions** of the exam so if you copy off a neighbor and put down the answers from another version we will know you cheated. Any student found engaging in academic misconduct will receive a score of 0 on this exam. All suspicious behavior will be reported to the student misconduct board.
- You have 50 minutes to complete the exam. Budget your time wisely.
SPEND NO MORE THAN 10 MINUTES PER PAGE!

GOOD LUCK!

1. (13 pts)

(a) Find a vector that has length 7 and is orthogonal to both $\mathbf{u} = \langle 1, 0, 2 \rangle$ and $\mathbf{v} = \langle 3, -2, 1 \rangle$

(b) Find the distance from point A to point B in the picture below (Hint: Use vector tools!)



(c) Consider the line through the points $(0, 0, 1)$ and $(3, 4, 5)$. Find the (x, y, z) point(s) where the line intersects the cylinder $x^2 + y^2 = 4$.

2. (12 pts)

- (a) Find parametric equations for the line of intersection of the planes $x + y + z = 10$ and $x - 3y - 4z = -10$.

- (b) Consider the plane that passes thru $(4, 4, 2)$ and contains the line $x = 5t, y = 3 + t, z = 4 - t$. Find the (x, y, z) point where this plane intersects the y -axis.

3. (12 pts)

(a) Give the precise 3D name for $4x^2 = 5y^2 + z$.

(b) Set up, but DO NOT EVALUATE, an integral that represents the arc length of the curve of intersection of the cylinder $x^2 + y^2 = 25$ and $x + 2y + z = 10$.

(c) Consider the curves $\mathbf{r}_1(t) = \langle 2t, 3t^2, t^3 \rangle$ and $\mathbf{r}_2(u) = \langle 2 - 2u, 3 + 3u, u^2 + 1 \rangle$. The curves have one point of intersection. Find the angle of intersection to the nearest degree.

4. (13 pts)

(a) Give parametric equations for the tangent line to $\mathbf{p}(t) = \langle t^2, 3 - 3t, 3 + 2t \rangle$ at $t = 1$.

(b) Find the principal unit normal vector $\mathbf{N}(t)$ for $\mathbf{q}(t) = \langle 3t, \cos(4t), \sin(4t) \rangle$.

(c) An object is moving such that its velocity is given by $\mathbf{r}'(t) = \langle t, \sin(t), t \cos(t) \rangle$ and its initial location is $\mathbf{r}(0) = \langle 0, 0, 1 \rangle$. Find the position function $\mathbf{r}(t)$.