Math 126 - Spring 2019

Exam 1

April 25, 2019

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.
  DO NOT CHEAT OR DO ANYTHING THAT LOOKS SUSPICIOUS!
  WE WILL REPORT YOU AND YOU MAY BE EXPELLED!
  Keep your eyes down and on your paper. If your TA sees your eyes wandering they will warn you only once before taking your exam from you.
- You have 50 minutes to complete the exam. Budget your time wisely.
  SPEND NO MORE THAN 10 MINUTES PER PAGE!

GOOD LUCK!

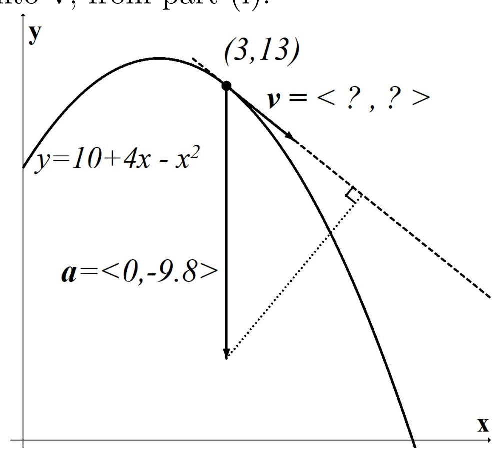
1. (11 pts)

(a) Find parametric equations for the line of intersection of the two planes $2x - y + 8z = 14$ and $2x - 2y + 4z = 2$.

(b) Consider the curve $y = 10 + 4x - x^2$ at $(x, y) = (3, 13)$.

i. Find a vector, $\mathbf{v}$, that has length 4 and is parallel to the tangent line to $y = 10 + 4x - x^2$ at $x = 3$.

ii. Find the length of the projection of $\mathbf{a} = \langle 0, -9.8 \rangle$ onto $\mathbf{v}$, from part (i).



2. (14 pts)

(a) Find the equation for the plane that is orthogonal to the plane $4x - z = 10$ and contains the points $P(3, 2, 3)$ and $Q(4, 5, 1)$.

(b) Find an equation for the surface consisting of all points (x, y, z) such that the distance from (x, y, z) to $(0, 0, 2)$ is equal to the distance from (x, y, z) to the xy-plane. **AND** give the precise name for this surface (Hint: Expand/Simplify your equation!)

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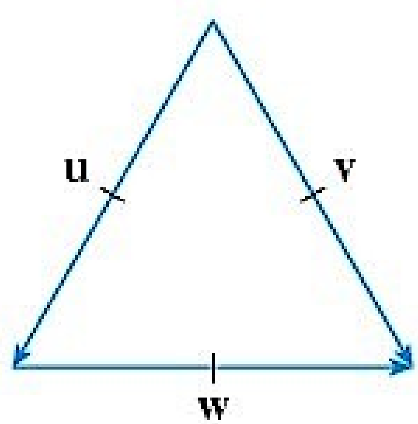
(c) In the picture below, $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$ are all vectors of length 3 (*i.e.* $|\mathbf{u}| = |\mathbf{v}| = |\mathbf{w}| = 3$). The vectors form an equilateral triangle (as shown). Using this information and important facts from class, find the following values:

i. $\mathbf{u} \cdot \mathbf{v} =$

ii. $|2\mathbf{u} + 2\mathbf{w}| =$

iii. the area of the triangle =



3. (13 pts) For ALL parts below, consider the curve, C, given by $x = 5 - t$, $y = t$, $z = t^2 - 10$.

(a) Find the **two** points (x, y, z) where the curve, C, intersects the cylinder $x^2 + y^2 = 13$.

(b) Find parametric equations for the tangent line, L, to the curve, C, at $t = 1$.

(c) Consider a different line L_2 given by $x = -2 + 6u$, $y = 2 + 4u$, and $z = 5 + 2u$. This line, L_2, and the curve, C, intersect in one point. Find the angle of intersection (round your answer to the nearest degree).

4. (12 pts) For ALL parts below, consider the curve given by the position function $\mathbf{r}(t) = \langle t^3, 3t^2, 6t \rangle$.

(a) Multiple Choice (Circle ALL that are true, there may be more than one):
Every point on the curve is also on the surface:

Circle ALL that true: (i) $18x = yz$ (ii) $y^2 + z^2 = 1$ (iii) $12y = z^2$ (iv) $y - z = 0$

(b) Find the curvature, κ, of $\mathbf{r}(t)$ at $t = 0$. (Reminder: You don't need to find the general formula, only the value at $t = 0$.)

(c) Find the distance (arc length) along the curve $\mathbf{r}(t)$ from the point $(0, 0, 0)$ to $(1, 3, 6)$.