ETH Zürich
PEACH-Lab

AI-assisted grading UI – testing exam
Basic math

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Name: *Student B*

Student ID: _____

This exam contains 6 pages (including this cover page) and 4 questions. Total of points is 31. Good luck!

Distribution of Marks

Question	Points	Score
1	8	
2	6	
3	9	
4	8	
Total:	31	

1. (8 points) Consider the function $f(x) = x^3 - 3x^2 - 9x + 5$. Find all the local maximum and local minimum points (both x and y coordinates).

minimum : $\rightarrow -\infty$

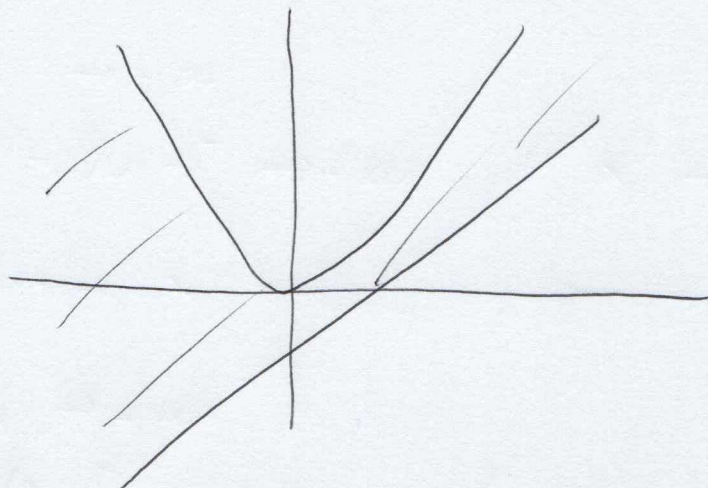$x^3 - 3x^2 - 9x + 5 \rightarrow -\infty$ if $x^3 \rightarrow -\infty$

$\Rightarrow$ minimum : $x = -\infty$

maximum : $\rightarrow +\infty$

$x^3 - 3x^2 - 9x + 5 \rightarrow +\infty$ if $x^3 \rightarrow +\infty$

$\Rightarrow$ max. : $x = +\infty$

2. (6 points) Find the area of the region enclosed by the parabola $y = x^2$ and the line $y = x + 2$.

No enclosed area

$\Rightarrow$ question is wrong

If there was an enclosed area, find overlapping points, then subtract the integrals from each other

3. Consider the following system of linear equations:

$$\begin{cases} x + y + z = 6 \\ 2y + 5z = \text{-}4 \\ 2x + 5y - z = 27 \end{cases}$$

(a) (3 points) Write the system in it's augmented matrix form $[A|b]$.

(b) (6 points) Solve the system for x, y and z using Gaussian elimination. Show your steps.

(a)
$$\left(\begin{array}{ccc|c} x & y & z & 6 \\ & 2y & 5z & -4 \\ 2x & 5y & -z & 27 \end{array} \right)$$

(b) Solution is easy to see: if $x = 5$, $y = 3$, $z = -2$

then
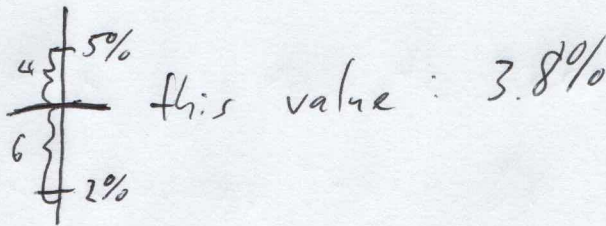$$x + y + z = 5 + 3 - 2 = 6$$
$$2y + 5z = 6 - 10 = -4$$
$$2x + 5y - z = 10 + 15 + 2 = 27$$

4. A factors has two machines, Machine A and Machine B, producing microchips.

- Machine A produces 60% of the total chips.
- Machine B produces 40% of the total chips.
- The defect rate of Machine A is 5% (i.e., 5% of chips from A are defective)
- The defect rate of Machine B is 2% (i.e., 2% of chips from B are defective)

(a) (4 points) What is the overall probability that a randomly selected chip from the factory is defective?

(b) (4 points) A chip is randomly selected and found to be defective. What is the probability that it came from Machine A?

(a) ~~should~~ ~~Klay~~ between 2% and 5%

4 ⎰ 5%
6 ⎰ 2%   this value : 3.8%

(b) ~70%

This page is intentionally left blank to accommodate work that wouldn't fit elsewhere and/or scratch work.