Test yourself on preliminary materials

Help

The **due date** for this quiz is **Thu 30 Oct 2014 2:00 PM CST**.

Dear class,

Do Not Panic!! :-)

This assignment gives you a **friendly** few self-assessment questions on the background material surrounding this class.

Do not worry if some of this material is unfamiliar, or you have already forgotten basic college mathematics. You can pick this up in no time.

We suggest that you use a pencil and paper for this assignment. Feel free to search the internet for answers and do not worry if you did not score too high. It is all good. Best wishes,

Sriram and Shalom

☐ **In accordance with the Coursera Honor Code, I (Kevin Zhu) certify that the answers here are my own work.**

Question 1

What is the minimum value for the function $f(x) = \sin(x^2)$ for $x \in \mathbb{R}$?

1. $\mathbb{R}$ is the set of all real numbers.
2. $\sin(x)$ always lies between -1 and $+1$
3. Try this *very cool* link to Wolfram Alpha !

- ○ -1
- ○ $-\frac{1}{3}$
- ○ π
- ○ $\frac{\pi}{2}$

Question 2

Which of the following functions $f(x)$ have *upper bounds* for $x \in \mathbb{R}$?

As an example, the function $f(x) = x^2$ has no upper bound for all $x \in \mathbb{R}$ But the functions $f(x) = \sin(x)$or $f(x) = 1 - x^2$are both upper bounded.

- [ ] $f(x) = -x$
- [ ] $f(x) = 17 - x^4$
- [ ] $f(x) = \tan(\frac{x}{2})$
- [ ] $f(x) = x - \lfloor x \rfloor$
- [ ] $x^2 - x$
- [ ] $f(x) = 1$

Question 3

Which of the matrices below are non-singular, or equivalently invertible?

A square matrix is singular if and only if one of the following conditions hold:

(a) A row (or column) can be written as a linear combination of the other rows (or columns), OR

(b) The determinant of the matrix is zero, OR

(c) It has a non-trivial null space.

You can use MATLAB, Mathematica, or Wolfram Alpha to find out.

- [ ] $A_3 = \begin{pmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{pmatrix}$
- [ ] $A_2 = \begin{pmatrix} 1 & 0 & 1 \\ 0 & -1 & 0 \\ -1 & 2 & 0 \end{pmatrix}$
- [ ] $A_4 = \begin{pmatrix} 1 & 2 & 2 & -1 \\ 2 & 4 & 4 & -3 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{pmatrix}$

- [ ] $A_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ -1 & 2 & 0 \end{pmatrix}$

Question 4

Which of the following problems are known to be solvable in polynomial time (efficiently solvable) on a computer?

Note: If this material is new to you, we recommend searching on the web to find the answers.

- [ ] Checking whether a given number is prime.
  Hint: Google AKS algorithm. :-)
- [ ] Deciding whether a given program can halt on a given input.
  Hint: Search for Alan Turing and his contributions to computer science.
- [ ] Inverting a matrix.
- [ ] Searching for the shortest path between two nodes in a graph.
  Hint: Go to google maps first.
- [ ] Solving a Linear Programming Problem (over real-valued variables).
  Hint: What is this course about?
- [ ] Factoring a given number into its prime factors.
  Hint: How can the RSA cryptosystem be broken?

Question 5

How many "A"s are there in Sriram's last name?

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Submit Answers Save Answers

You cannot submit your work until you agree to the Honor Code. Thanks!