

## Mathematics 1350H – Linear algebra I: matrix algebra

TRENT UNIVERSITY, Fall 2009

ASSIGNMENT #1

*Due on Friday, 25 September, 2009*

### De Omnibus Rebus

“This little pig went to market:  
This little pig staid at home.

“BY Her Radiancy’s express command,” said the Governor, as he conducted the travellers, for the last time, from the Imperial presence, “I shall now have the ecstasy of escorting you as far as the outer gate of the Military Quarter, where the agony of parting—if indeed Nature can survive the shock—must be endured! From that gate grurmstipths start every quarter of an hour, both ways——”

“Would you mind repeating that word?” said Norman. “Grurm——?”

“Grurmstipths,” the Governor repeated. “You call them omnibuses in England. They run both ways, and you can travel by one of them all the way to the harbour.”

The old man breathed a sigh of relief; four hours of courtly ceremony had wearied him, and he had been in constant terror lest something should call into use the ten thousand additional bamboos.

In another minute they were crossing a large quadrangle, paved with marble, and tastefully decorated with a pigsty in each corner. Soldiers, carrying pigs, were marching in all directions: and in the middle stood a giagntic officer giving orders in a voice of thunder, which made itself heard above all the uproar of the pigs.

“It is the Commander-in-Chief!” the Governor hurriedly whispered to his companions, who at once followed his example in prostrating themselves before the great man. The Commander gravely bowed in return. He was covered with gold lace from head to foot: his face wore an expression of deep midery: and he had a little black pig under each arm. Still the gallant fellow did his best, in the midst of the orders he was every moment issuing to his men, to bid a courteous farewell to the departing guests.

“Farewell, oh old one—carry these three to the South corner—and farewell to thee, thou young one—put this fat one on the top of the others in the Western sty—may your shadows never be less—woe is me, it is wrongly done! Empty out all the sties and begin again!” And the soldier leant upon his sword, and wiped away a tear.

“He is in distress,” the Governor explained as they left the court. “Her Radiancy has commanded him to place twenty-four pigs in those four sties, so that, as she goes round the court, she may always find the number in each sty nearer to ten than the number in the last.”

“Does she call ten nearer to ten than nine is?” said Norman.

“Surely,” said the Governor. “Her Radiancy would admit that ten is nearer to ten than nine is—and also nearer than eleven is.”

“Then I think it can be done,” said Norman.

The Governor shook his head. “The Commander has been transferring them in vain for four months,” he said. “What hope remains? And Her Radiancy has ordered up ten thousand additional——”

“The pigs don’t seem to enjoy being transferred,” the old man hastily interrupted. He did not like the subject of bamboos.

“They are only *provisionally* transferred, you know,” said the Governor. “In most cases they are immediately carried back again: so they need not mind it. And all is done with the greatest care, under the personal superintendence of the Commander-in-Chief.”

“Of course she would only go *once* round?” said Norman.

“Alas, no!” sighed their conductor. “Round and round. Round and round. These are Her Radiancy’s own words. But oh, agony! Here is the outer gate, and we must part!” He sobbed as he shook hands with them, and the next moment was briskly walking away.

“He *might* have waited to see us off!” said the old man, piteously.

“And he needn’t have begun whistling the very *moment* he left us!” said the young one, severely. “But look sharp—here are two what’s-his-names in the act of starting!”

Unluckily, the sea-bound omnibus was full. “Never mind,” said Norman cheerily. “We’ll walk on till the next one overtakes us.”

They trudged on in silence, both thinking over the military problem, till they met an omnibus coming from the sea. The elder traveller took out his watch. “Just twelve minutes and a half since we started,” he remarked in an absent manner. Suddenly the vacant face brightened; the old man had an idea. “My boy!” he shouted, bringing his hand down upon Norman’s shoulder so suddenly as for a moment to transfer his centre of gravity beyond the base of support.

Thus taken off his guard, the young man wildly staggered forwards, and seemed about to plunge into space: but in another moment he had gracefully recovered himself. “Problem in Precession and Nutation,” he remarked—in tones where filial respect only just managed to conceal a shade of annoyance. “What is it?” he hastily added, fearing his father might have been taken ill. “Will you have some brandy?”

“When will the next omnibus overtake us? When? When?” the old man cried, growing more excited every moment.

Norman looked gloomy. “Give me time,” he said. “I must think it over.” And once more the travellers passed on in silence—a silence only broken by the distant squeals of the unfortunate little pigs, who were still being provisionally transferred from sty to sty, under the personal superintendence of the Commander-in-Chief.

1. Two mathematical questions are posed in the story. Answer both and explain your answers fully. [10]

### **For One Who Loves An Engineer**

Sing not to me of silicon chips  
The chocolate kind are sweeter  
But sweeter still would be your lips –  
Put down that voltage meter!

A jug of wine (viscosity 3),  
Loaf of bread (shear modulus 7)  
But me you cannot quantify –  
Oh, glory be to heaven!

*Miriam Nadel*