Sample exam #1, Mar. 01, 2018 **Name:**
Math 445, University of New Hampshire

1. Write one line of Matlab code that returns the even numbers from 48 to 764, inclusive.

2. Given a matrix A, write one line of Matlab code that returns a matrix consisting of the 3rd, 11th, and 1st columns of A, in that order.

3. Write a few lines of Matlab code that would plot $y = x^{-2} \sin 4x - 1$ versus x for $1 \leq x \leq 2\pi$ as a magenta dashed line with a superimposed grid. Label your axes.

4. Calculate the product of the matrix and vector.

$$\begin{bmatrix} 2 & 1 & 0 \\ -1 & 3 & 4 \\ 5 & 0 & 6 \end{bmatrix} \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix} =$$

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5. Write a few lines of Matlab code that could calculate the product of the matrix and vector.

$$\begin{bmatrix} 2 & 1 & 0 \\ -1 & 3 & 4 \\ 5 & 0 & 6 \end{bmatrix} \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix} =$$

6. Write two lines of Matlab code that would evaluate this sum.

$$\sum_{n=0}^{10} \frac{n}{(n+1)^2}$$

7. Write Matlab code that would solve the system of equations.

$$\begin{aligned} 3y - x + 4z - 6 &= 0 \\ 5z + 2x - 7 &= 0 \\ y - 2x + 1 &= 0 \end{aligned}$$

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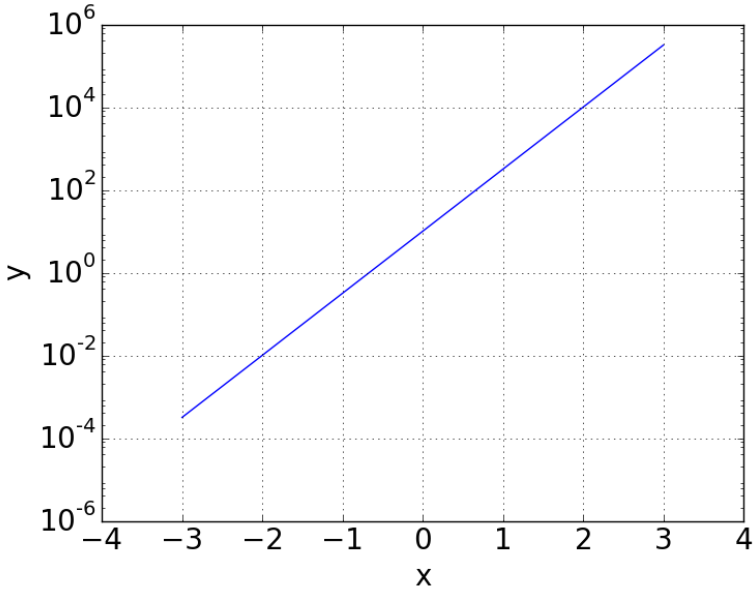
8. What is y as a function of x? Give an explicit formula for $y(x)$ with specific numerical constants.



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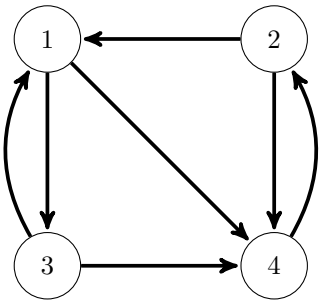
9. Write Matlab code that defines a function named `myfactorial` that uses a **for** loop to compute $n!$ (the factorial of n) according to the formula

$$n! = n \cdot (n-1) \cdot (n-2) \cdot \ldots \cdot 2 \cdot 1 = \prod_{k=1}^{n} k$$

10 (a) Write down the matrix A for hamster dynamics $x^{n+1} = A\, x^n$, where $x = (x_1, x_2, x_3, x_4)$, assuming hamsters choose and run through a random tunnel from their current house at each time step.



(b) Write a few lines of Matlab code that would estimate the steady-state distribution of hamsters $x = \lim_{n\to\infty} x^n$ from twenty iterations of $x^{n+1} = A\, x^n$.