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- Write the code to make a 3-D lit surface plot (using meshgrid()) with interpolated shading of the following function:

$$z = \cos(2\pi[3x - 4y]) \quad 0 \leq x \leq 1 \quad (25 \text{ pts}) \quad 0 \leq y \leq 0.5 \quad (21 \text{ pts})$$

- Add code to make a contour plot (as Figure 2) for the surface in Problem 1.
- Add appropriate axis and title labels for the Figures 1 and 2 in Problems 1 and 2.
- The inverse of the following rotation matrix, $R1$, should be the same matrix but with $-\theta$ substituted for θ :

$$R1 = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$$

- Create $R1_{inv}$ by substituting $-\theta$ for θ in $R1$ and simplifying the terms using $\cos(-\theta) = \cos(\theta)$ and $\sin(-\theta) = -\sin(\theta)$.
 - Verify by hand that $R1$ times $R1_{inv}$ equals the identity matrix.
 - Which of the following Matlab® command lines could represent a rotation of an initial vector by +30 degrees and then -60 degrees?
 - `>> [1, 0] * [sqrt(3)/2, 1/2; -1/2, sqrt(3)/2] * [sqrt(3)/2, 1/2; -1/2, sqrt(3)/2]^2`
 - `>> [1/2, sqrt(3)/2; -sqrt(3)/2, 1/2] * [sqrt(3)/2, -1/2; 1/2, sqrt(3)/2] * [1; 0]`
 - `>> 1./[sqrt(3)/2, -1/2; 1/2, sqrt(3)/2]^2 * [sqrt(3)/2, -1/2; 1/2, sqrt(3)/2] * [1; 0]`
- Write code to use a matrix, a vector, and the inv() function to solve each of the following sets of simultaneous equations:
 - $$\begin{aligned} x + 2y &= 1 \\ 3x + 5y &= -1 \end{aligned}$$
 - $$\begin{aligned} z &= 4 \\ -x + z &= -2 \\ \frac{1}{2}y - z &= 1 \end{aligned}$$
 - When using the Matlab® command for a pseudoinverse (that is used to solve least-squares problems involving rectangular matrices), what is the shape of the resulting matrix? (Hint: use the index of the *Matlab Primer* to look up pseudoinverse.)

7. Use the following array definitions for the question below:

$A = \text{magic}(2) = [1,3;4,2];$ $B = \text{eye}(2);$ $C = [1,2,3,5];$

What is the result of the evaluation of each of the following logical expressions in Matlab®?

a) $\gg A == B$ b) $\gg \text{all}(C - B > 0)$ c) $\gg C \leq A$ d) $\gg A == B \mid C \leq A$

8. Write Matlab® code that uses `polyfit()` to find linear and quadratic fits for the following data points. Store the coefficients in an array called *a* in each case.

<i>x</i> values:	0	1	2	3
<i>y</i> values:	1	2	3	6

9. Write a script file that plots the data for Problem 8 and superimposes a plot of the linear and quadratic fits from Problem 8. Hint: for the linear and quadratic fits, use *x* values from the data and create *y* values using the *a* arrays.

10. Write a single script file to do the following tasks (in sequence) for a predefined square matrix, *A*:

- Compute $d = \det(A)$
- If d is negative, display a warning message and return to parent program
- Otherwise, compute the inverse of *A* and
- Display the value of the inverse of *A*

REF: [1] The Mathworks, Inc, *Matlab® Primer*, Natick, MA: The Mathworks, Inc, 2012.