1 Problem 2

Exercise 2.3 on p. 42
Matlab Solution in file Problem2.m

Solution: $\frac{-1}{\sqrt{10}*\sqrt{14}}$

$V1 =< 1, -3, 0 >$
$V2 =< 2, 1, 3 >$

$$cos(\theta) = \frac{V1 \cdot V2}{\sqrt{1^2 + -3^2 + 0^2} * \sqrt{2^2 + 1^2 + 3^2}}$$

1. $cos(\theta) = \frac{V1 \cdot V2}{\sqrt{1^2 + -3^2 + 0^2} * \sqrt{2^2 + 1^2 + 3^2}}$
2. $V1 \cdot V2 = (1 * 2) + (1 * -3) + (0 * 3) = -1$
3. $\sqrt{1^2 + -3^2 + 0^2} = \sqrt{1 + 9} = \sqrt{10}$
4. $\sqrt{2^2 + 1^2 + 3^2} = \sqrt{4 + 1 + 9} = \sqrt{14}$
5. $cos(\theta) = \frac{V1 \cdot V2}{\sqrt{1^2 + -3^2 + 0^2} * \sqrt{2^2 + 1^2 + 3^2}} = \frac{-1}{\sqrt{10}*\sqrt{14}}$

$$cos(\theta) = \frac{V1 \cdot V2}{\sqrt{1^2 + -3^2 + 0^2} * \sqrt{2^2 + 1^2 + 3^2}} = \frac{-1}{\sqrt{10}*\sqrt{14}}$$

2 Problem 3

Compute the Jacobian

$x = u - v + w$
$y = u^2 - v^2 - w^2$
$z = u^3 + v$

$Jacobian(u, v, w) =$

$$\begin{pmatrix} 1 & -1 & 1 \\ 2u & -2v & -2w \\ 3u^2 & 1 & 0 \end{pmatrix}$$

3 Problem 4

Exercise 3.4 on pg. 76
Matlab Solution in file Problem4.m

$M1 =$

$$\begin{pmatrix} 2 & -1 & 1 & 0 \\ 1 & 3 & 1 & -1 \\ -2 & 1 & 0 & 1 \end{pmatrix}$$

$M2 =$

$$\begin{pmatrix} 1 & 2 \\ -2 & 0 \\ 2 & -1 \\ 1 & 1 \end{pmatrix}$$

$M1 \cdot M2 =$

$$\begin{pmatrix} (2*1)+(-1*-2)+(1*2)+(0*1) & (2*2)+(-1*0)+(1*-1)+(0*1) \\ (1*1)+(3*-2)+(1*2)+(-1*1) & (1*2)+(3*0)+(1*-1)+(-1*1) \\ (-2*1)+(1*-2)+(0*2)+(1*1) & (-2*2)+(1*0)+(0*-1)+(1*1) \end{pmatrix}$$

$=$

$$\begin{pmatrix} 6 & 3 \\ -4 & 0 \\ -3 & -3 \end{pmatrix}$$

4 Problem 5

The textbook, Assignment 3.1 on pp. 78 - 79
Matlab Solutions in files evaluate.m and evaluate2.m

5 Problem 6

Let $z = 5 + 3i$ and $w = 2 - 4i$

(a) $\bar{w} = \Large 2 + 4i$

(b) $z + w = \Large 7 - i$

$5 + 2 = 7$
$3i + -4i = -i$
$z + w = 7 - i$

(c) $z - w = \Large 3 + 7i$

$5 - 2 = 3$
$3i - (-4i) = 7i$
$z - w = 3 + 7i$

(d) $zw = \Large 22 - 14i$

$(5 + 3i)(2 - 4i) =$
$10 - 20i + 6i - 12i^2 =$
$10 - 14i + 12 =$
$22 - 14i$

(e) $z/w = \Large \frac{-1}{10} + \frac{13i}{10}$

$\frac{5+3i}{2-4i} =$

$\frac{(5+3i)(2+4i)}{(2-4i)(2+4i)} =$

$\frac{10+6i+20i+12i^2}{4-8i+8i-16i^2} =$

$\frac{10+26i-12}{20} =$

$\frac{-2+26i}{20} =$

$\frac{-1}{10} + \frac{13i}{10}$

6 Problem 7

Prove that

$$\sin^3(\theta) = \frac{3}{4}sin(\theta) - \frac{1}{4}sin(3\theta)$$

1. $sin^3(\theta) = (\frac{e^{i\theta}-e^{-i\theta}}{2i})^3$
2. $= \frac{(e^{i\theta}-e^{-i\theta})^3}{8i^3}$
3. $= -\frac{1}{8i}((e^{i\theta})^3 - 3(e^{i\theta})^2(e^{-i\theta}) + 3(e^{i\theta})(e^{-i\theta})^2 - (e^{-i\theta})^3)$
4. $= -\frac{1}{8i}(e^{3i\theta} - 3e^{i\theta} + 3e^{-i\theta} - e^{-3i\theta})$

5. $$= \frac{3}{4}(\frac{e^{i\theta}-e^{-i\theta}}{2i}) - \frac{1}{4}(\frac{e^{3i\theta}-e^{-3i\theta}}{2i})$$

6. $$= \frac{3sin\theta-sin(3\theta)}{4}$$

7. $$= \frac{3}{4}sin(\theta) - \frac{1}{4}sin(3\theta)$$