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**Please indicate your answers by entering the option ( (i), (ii), (iii) or (iv) ) where asked.  
You should append the completed document as a pdf with your type written worked  
solutions and upload to Blackboard by Friday 22<sup>nd</sup> of February 2019.**

**Q 2.31**

Part (a):

- (i) 4
- (ii) 13
- (iii) 26
- (iv) 18

**Your Answer (i)-(iv): (ii) 13**

Part (b):

- (i) 0
- (ii) 12
- (iii) 7
- (iv) 4

**Your Answer (i)-(iv): (i) 0**

### Q 3.2

Part (a):

- (i) 0.1241
- (ii) 0.8125
- (iii) 0.074995
- (iv) 0.003462

**Your Answer (i)-(iv): (ii) 0.8125**

Part (b):

- (i) 0.72481
- (ii) 0.85261
- (iii) 0.62849
- (iv) 0.17238

**Your Answer (i)-(iv): (ii) 0.85261**

Part (c):

- (i) 0.65782
- (ii) 0.59371
- (iii) 0.45802
- (iv) 0.85261

**Your Answer (i)-(iv): (iv) 0.85261**

**Q 4.24**

(i) Inverse(a)=

|         |         |        |
|---------|---------|--------|
| -0.7143 | 0.0     | 1.4286 |
| 0.2571  | 0.1000  | 0.2857 |
| -0.2286 | -0.2000 | 0.8571 |

Inverse(b)=

|         |         |         |        |
|---------|---------|---------|--------|
| 1.6667  | 2.8889  | -2.2222 | 1.0000 |
| 0.0     | 0.3333  | -0.3333 | 0.0    |
| -0.3333 | -0.4444 | 0.1111  | 0.0    |
| 1.5000  | 2.0000  | -1.5000 | 0.5000 |

(ii)

Inverse(a)=

|         |         |        |
|---------|---------|--------|
| 0.7243  | 0.0     | 1.3286 |
| 1.2571  | 0.1000  | 0.2757 |
| -0.2386 | -0.2010 | 0.9571 |

Inverse(b)=

|         |         |         |         |
|---------|---------|---------|---------|
| 1.6677  | 2.9889  | 3.2222  | 1.01700 |
| 0.3433  | -0.3433 | 0.3333  | 0.00371 |
| -0.3433 | -0.2879 | 0.2111  | 0.0     |
| 1.2400  | 2.0120  | -1.5783 | 0.5600  |

(iii)

Inverse(a)=

|         |         |        |
|---------|---------|--------|
| 0.7143  | 0.003   | 2.3276 |
| 1.2671  | 0.1100  | 0.3759 |
| -0.2486 | -0.2110 | 0.9771 |

Inverse(b)=

|         |         |         |         |
|---------|---------|---------|---------|
| 1.6877  | 3.9789  | 3.2002  | 2.01800 |
| 0.3533  | -0.4433 | 0.3333  | 0.02371 |
| -0.3443 | -0.2999 | 0.3121  | 0.0382  |
| 1.2420  | 3.0130  | -1.5733 | 0.5610  |

(iv)

Inverse(a)=

|         |         |        |
|---------|---------|--------|
| 0.8343  | 1.01    | 1.3336 |
| 2.2572  | 0.1003  | 0.3857 |
| -0.2486 | -0.2110 | 0.9671 |

Inverse(b)=

|         |         |         |         |
|---------|---------|---------|---------|
| 1.6777  | 4.9889  | 3.2232  | 1.11700 |
| 0.3443  | -0.3443 | 0.3233  | 0.07371 |
| -0.3443 | -0.2979 | 0.3211  | 0.07800 |
| 1.2480  | 2.1220  | -1.5883 | 0.5621  |

**Your Answer (i)-(iv): (i)**

### Solutions

2.31

a)

$$|A| = a(ei - fh) - b(di - fg) + c(dh - eg)$$

$$|A| = 1((3)(1)-(6)(1)) - 5((2)(1)-(6)(1)) + 4((2)(1)-(3)(1))$$

$$|A| = 1(3-6) - 5(2-6) + 4(2-3)$$

$$|A| = -3 + 20 - 4$$

$$|A| = 13$$

b)

$$|B| = a(f(kp-lo) - g(jp-ln) + h(jo-kn)) - b(e(kp-lo) - (g(ip-lm) + h(io-km))) + c(e(jp-ln) - f(ip-lm) + h(in-jm)) - d(e(jo-kn) - f(io-km) + g(in-jm))$$

$$|B| = 1(6(11*16)-(12*15))-7((10*16)-(12*14))+8((10*15)-(11*14)) - 2(5(19*15)-(11*13))-7((9*16)-(12*13))+8((9*15)-(11*13))) + 3(5((11*16)-(12*15))-6((9*16)-(12*13))+8((9*14)-(10*13)))-4(5((10*15)-(11*14))-6((9*15)-(11*13))+7((9*14)-(10*13)))$$

$$|B| = 1(6(176-180)-7(160-168)+8(150-154))-2(5(135-143)-7(144-156)+8(135-143))+3(5(176-180)-6(144-156)+8(126-130))-4(5(150-154)-6(135-143)+7(126-130))$$

$$|B| = 1(-24+56-32)-2(-20+84-64)+3(-40+72-32)-4(-20+48-28)$$

$$|B| = 1(0)-2(0)+3(0)-(0)$$

$$|B| = 0+0+0+0$$

$$|B| = 0$$

3.2

a) Bisection Method

1<sup>st</sup> Iteration

$$f(a) = 0 - 2e^{-0} = -2$$

$$f(b) = 1 - 2e^{-1} = 0.264241177$$

$$x_{ns1} = \frac{a+b}{2} = \frac{0+1}{2} = 0.5$$

$$f(x_{ns1}) = 0.5 - 2e^{-0.5} = -0.7130613194$$

$$f(a) * f(x_{ns1}) = -2 * -0.7130613194 = 1.426122639$$

2<sup>nd</sup> Iteration

$$x_{ns2} = \frac{0.5+1}{2} = 0.75$$

$$f(x_{ns2}) = 0.75 - 2e^{-0.75} = -0.1947331055$$

$$f(a) * f(x_{ns2}) = -0.7130613194 * -0.1947331055 = 0.1388566451$$

3<sup>rd</sup> Iteration

$$x_{ns3} = \frac{0.75+1}{2} = 0.875$$

$$f(x_{ns3}) = 0.875 - 2e^{-0.875} = 0.04127596064$$

$$f(a) * f(x_{ns3}) = -0.1947331055 * 0.04127596064 = -0.008038114469$$

$$x_{ns4} = \frac{0.75+0.875}{2} = 0.8125$$

b) Secant Method

$$x_3 = x_2 - \frac{f(x_2)f(x_1-x_2)}{f(x_2)-f(x_3)}$$

1<sup>st</sup> Iteration

$$0.264211177 - \frac{0.2642411177 * (-1)}{-2 - 0.26421177} = 0.8832981542$$

2<sup>nd</sup> Iteration

$$0.8832981542 - \frac{0.05646385986 * 0.1167018458}{0.264241177 - 0.05646385986} = 0.8515842085$$

3<sup>rd</sup> Iteration

$$0.8515842085 - \frac{(-1.892498785 * 10^{-3}) * (0.0317139457)}{0.05646385986 - (1.892498785 * 10^{-3})} = 0.8526126929$$

c) Newton's Method

1<sup>st</sup> Iteration

$$f(x_1) = 1 - 2e^{-1} = 0.2642411177$$

$$f'(x_1) = 1 + 2e^{-1} = 1.735758882$$

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} = 1 - \frac{0.2642411177}{1.735758882} = 0.8477662304$$

2<sup>nd</sup> Iteration

$$f(x_2) = 0.8477662304 - 2e^{-0.8477662304} = -8.975260733 \cdot 10^{-3}$$

$$f'(x_2) = 1 + 2e^{-0.8477662304} = 1.856741491$$

$$x_3 = 0.8477662304 - \frac{-8.975260733 \cdot 10^{-3}}{1.856741491} = 0.8526001078$$

3<sup>rd</sup> Iteration

$$f(x_3) = 0.8526001078 - 2e^{-0.8526001078} = -9.993362432 \cdot 10^{-6}$$

$$f'(x_3) = 1 + 2e^{-0.8526001078} = 1.852610101$$

$$x_4 = 0.8526001078 - \frac{-9.993362432 \cdot 10^{-6}}{1.852610101} = 0.852605502$$

4.24

a)

$$\begin{array}{ccc|ccc} -1 & 2 & 1 & 1 & 0 & 0 & R1(-1) \end{array}$$

$$\begin{array}{ccc|ccc} 2 & 2 & -4 & 0 & 1 & 0 \end{array}$$

$$\begin{array}{ccc|ccc} 0.2 & 1 & 0.5 & 0 & 0 & 1 \end{array}$$

$$\begin{array}{ccc|ccc} 1 & -2 & -1 & -1 & 0 & 0 \end{array}$$

$$\begin{array}{ccc|ccc} 2 & 2 & -4 & 0 & 1 & 0 \end{array}$$

$$\begin{array}{ccc|ccc} 0.2 & 1 & 0.5 & 0 & 0 & 1 \end{array}$$

$$R2 - R1(2)$$

$$R3 - R1(0.2)$$

$$\begin{array}{ccc|ccc} 1 & -2 & -1 & -1 & 0 & 0 \end{array}$$

$$\begin{array}{ccc|ccc} 0 & 6 & -2 & 2 & 1 & 0 \end{array}$$

$$\begin{array}{ccc|ccc} 0 & 1.4 & 0.7 & 0.2 & 0 & 1 \end{array}$$

$$R2/6$$

$$\begin{array}{ccc|ccc} 1 & -2 & -1 & -1 & 0 & 0 \end{array}$$

$$\begin{array}{ccc|ccc} 0 & 1 & -0.3333 & 0.3333 & 0.1666 & 0 \end{array}$$

$$\begin{array}{ccc|ccc} 0 & 1.4 & 0.7 & 0.2 & 0 & 1 \end{array}$$

$$R1 + R2(2)$$

$$R3 - R2(1.4)$$

$$\begin{array}{ccc|ccc} 1 & 0 & -1.6666 & -0.3333 & 0.3333 & 0 \end{array}$$

$$\begin{array}{ccc|ccc} 0 & 1 & -0.3333 & 0.3333 & 0.1666 & 0 \end{array}$$

$$\begin{array}{ccc|ccc} 0 & 0 & 1.1666 & -0.2666 & -0.2333 & 1 \end{array}$$

$$R3/1.1666$$

$$\begin{array}{ccc|ccc} 1 & 0 & -1.6666 & -0.3333 & 0.3333 & 0 \end{array}$$

$$\begin{array}{ccc|ccc} 0 & 1 & -0.3333 & 0.3333 & 0.1666 & 0 \end{array}$$

$$\begin{array}{ccc|ccc} 0 & 0 & 1 & -0.2286 & -0.2 & 0.8571 \end{array}$$

$$R1 + R3(1.6666)$$

$$R2 + R3(0.3333)$$

$$\begin{array}{ccc|ccc} 1 & 0 & 0 & -0.7143 & 0 & 1.4286 \end{array}$$

$$\begin{array}{ccc|ccc} 0 & 1 & 0 & 0.2571 & 0.1 & 0.2857 \end{array}$$

$$\begin{array}{ccc|ccc} 0 & 0 & 1 & -0.2286 & -0.2 & 0.8571 \end{array}$$

b)

-1 -2 1 2 | 1 0 0 0  
 1 1 -4 -2 | 0 1 0 0  
 1 -2 -4 -2 | 0 0 1 0  
 2 -4 1 -2 | 0 0 0 1

R1(-1)

1 2 -1 -2 | -1 0 0 0  
 1 1 -4 -2 | 0 1 0 0  
 1 -2 -4 -2 | 0 0 1 0  
 2 -4 1 -2 | 0 0 0 1

R2-R1

R3-R1

R4-R2(2)

1 2 -1 -2 | -1 0 0 0  
 0 -1 -3 0 | 1 1 0 0  
 0 -4 -3 0 | 1 0 1 0  
 0 -8 3 2 | 2 0 0 1

R2(-1)

1 2 -1 -2 | -1 0 0 0  
 0 1 3 0 | -1 -1 0 0  
 0 -4 -3 0 | 1 0 1 0  
 0 -8 3 2 | 2 0 0 1

R1-R2(2)

R3+R2(4)

R4+R2(8)

1 0 -7 -2 | 1 2 0 0  
 0 1 3 0 | -1 -1 0 0  
 0 0 9 0 | -3 -4 1 0  
 0 0 27 2 | -6 -8 0 1

R3/9

1 0 -7 -2 | 1 2 0 0  
 0 1 3 0 | -1 -1 0 0  
 0 0 1 0 | 0.3333 -0.4444 0.1111 0  
 0 0 27 2 | -6 -8 0 1

R1+R3(7)

R2-R3(3)

R4-R3(27)

1 0 0 -2 | -1.3333 -1.1111 0.7777 0  
 0 1 0 0 | 0 0.3333 -0.3333 0  
 0 0 1 0 | -0.3333 -0.4444 0.1111 0  
 0 0 0 2 | 3 4 -3 1

R4/2

1 0 0 -2 | -1.3333 -1.1111 0.7777 0  
 0 1 0 0 | 0 0.3333 -0.3333 0  
 0 0 1 0 | -0.3333 -0.4444 0.1111 0  
 0 0 0 1 | 1.5 2 -1.5 0.5

R1+R4(2)

1 0 0 0 | 1.6667 2.8889 -2.2222 1  
 0 1 0 0 | 0 0.3333 -0.3333 0  
 0 0 1 0 | -0.3333 -0.4444 0.1111 0  
 0 0 0 1 | 1.5 2 -1.5 0.5