Madeline field maths for graphics semester 1 course work

ps srry its not formatted correctly/not finished, i am unexpectly having to take care of a friend of mine who got ill and doing this on my phone as i dont have my pc/laptop, if u want i can resubmit properly tmrw, apologies if this doesnt format very well.

Q2 not included due to having already been submitted

Q1

Pin: 9753

a.

9753₁₀ = 2^13 + 2^10 + 2^9 + 2^4 + 2^3 + 2^0

= 0010 0110 0001 1001₂

[found using the div2 remanider method]

b.

9753₁₀ = 0x2619

0010 = 0x2

0110 = 0x6

0001 = 0x1

1001 = 0x9

c.

2nd comp = 1101 1001 1110 0111

1st comp = 1101 1001 1110 0110

d.

ans = 0111 0110 0010 0110

1001 1100 0011 1111

+1101 1001 1110 0111

over:0011 0011 1111 0110

=0111 0110 0010 0110

e.

ans = 30246

sum(1(0) 2(1) 4(1) 8(0)

16(0) 32(1) 64(0) 128(0)

256(0) 512(1) 1024(1) 2048(0)

4096(1) 8192(1) 16384(1) -32768(0))

= 30246

f.

ans = -10290

25000₁₀ = 0110 0001 1010 1000₂

25000 = 2^3 +2^5 +2^7 + 2^8 + 2^13 + 2^14

[found using the div2 remanider method]

0111 0110 0010 0110

+0110 0001 1010 1000

over:1100 0000 0100 0000

=1101 0111 1100 1110

sum(1(0) 2(1) 4(1) 8(1)

16(0) 32(0) 64(1) 128(1)

256(0) 512(1) 1024(1) 2048(1)

4096(1) 8192(0) 16384(1) -32768(1))

= -10290 [22478 unsigned]

Q3.

a. ans = B

b. ans = D

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| p | q | Not(p) | P . not(q) | Not(p) + p . Not(q) |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |

Not(p+q)

c. ans = A

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| p | q | r | Not(q).r | p+not(q).r | Not(p+not(q).r) |
| 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 | 0 |

d. ans = C

TODO inserte pic of paper working

e. ans = A

f. ans = H

g. ans = E

2 -> 4 = 2

-3 -> 1 = 4

-5 \_. -2 = 3

h. ans = G

0.1875₁₀ = 2^-3 + 2^-4 = 0.0011₂

i. ans = D

2x+y = 7

5x-2y = 4

y=-2x+7

5x-2(-2x+7) = 4

5x+4x-14 = 4

9x = 18

x = 2

2(2)+y = 7

4+y = 7

y=3

j. ans = i

x = 3cosθ

y = 8sinθ

dx = -3sinθ

dy = 8cosθ

dy/dx = 8cosθ/-3sinθ = 8/-3tanθ

8/-3tanθ = 2

8/tanθ = -6

tan^-1(θ) = -6/8

1 = -6/8tanθ

tanθ = -4/3

θ = tan^-1(-4/3)

θ = -53.1301

x = 1.8

y = -6.6

Q4.

a.

A = (3.5,0,4)

B = (0,16,10)

C = (2.5,12,9)

A->B = -3.5x+16y+6z

B->C = +2.5x-4y-z

C->A = +x-12y-5z

|A->B| = 17.443

|B->C| = 4.822

|C->A| = 13.038

b.

a = B<->C , b = C<->A , c = A<->B

cosθ꜀ = ab/|a||b|

ab = (-2.5\*1)+(4\*-12)+(1\*-5) = -55.5

θ꜀ = cos^-1(-55.5/4.822\*13.038) = 151.98’

cosθ₆ = ac/|a||c|

ac = (2.5\*3.5)+(-4\*-16)+(-1\*-6) = 78.75

θ₆ = cos^-1(78.75/4.822\*17.443) = 20.57’

θₐ = 180 – θ₆ – θ꜀ = 7.45’

c.

TODO insert triagnle

angle of B = tan^-1(2.5/6) == 22.62’ (from facing ‘left’)

Normal vector of slope = normal from facing ‘left’ rot by 22.62’

preRotNorm = [-1,0,0]

|  |  |
| --- | --- |
| cos(22.26) | -sin(22.26) |
| sin(22.26) | cos(22.26) |

slopeNorm = [-1,0] .

= [-0.923, 0.385, 0]

d.

matix perpendicular to [-0.923, 0.385, 0] =

|  |  |
| --- | --- |
| cos(22.26) | -sin(22.26) |
| sin(22.26) | cos(22.26) |

[0,1] .

[0.345,0.923,0]

D = (2.5,16,14) + 0.75[0.345,0.923,0] = (2.759,16.692,14)

Q5.

a.

|  |  |  |
| --- | --- | --- |
| 5-4-3 | -4+0-9 | 0 |
| -5-2+0 | 4+0+0 | 0 |
| 0+4+2 | 0+0+6 | 0 |

A.B =

|  |  |
| --- | --- |
| -2 | -13 |
| -7 | 4 |
| 6 | 6 |

=

|  |  |
| --- | --- |
| 10+12 | -5+8 |
| -4+0 | 2+0 |
| 2-9 | -1-6 |

B.C =

|  |  |
| --- | --- |
| 22 | 3 |
| -4 | 2 |
| -7 | -7 |

=

|  |  |
| --- | --- |
| 20 | -10 |
| -11 | 6 |
| -1 | -1 |

A.B+B.C =

|  |  |
| --- | --- |
| cos(20) | sin(20) |
| -sin(20) | cos(20) |

b.

i.

|  |  |
| --- | --- |
| 2 | 0 |
| 0 | 3 |

ii.

|  |  |
| --- | --- |
| 1 | 2 |
| 2 | 1 |

iii.

|  |  |
| --- | --- |
| 1 | 0 |
| 0 | -1 |

iv

|  |  |
| --- | --- |
| 1.88 | 1.03 |
| -0.68 | 2.82 |

i.ii

|  |  |
| --- | --- |
| 3.94 | 4.79 |
| 4.96 | 1.46 |

(i.ii).iii

|  |  |
| --- | --- |
| 3.94 | -4.79 |
| 4.96 | -1.46 |

((i.ii).iii).iv

c.

|  |  |
| --- | --- |
| cos(55) | -sin(55) |
| sin(55) | cos(55) |

rot matrix =

reflect around 3y=x-3

grad = 1/3 so rotate by angle = -tan-1(1/3) = -18.435’

then translate by up 1 [3 \* 1/3 = 1]

then reflect around y axis

then translate down 1

then rotate by 18.435’