**Self-assessment answers: 11 Vectors**

**1.** (a) 



(b) 

∴  and so they are parallel.  *[6 marks]*

**2.** (a)  so 

(b) 





= 0.431 radians (24.7°)  *[7 marks]*

**3.** (a) Direction vector is , so the vector equation of l1 is  (or equivalent).

In Cartesian form, this is *x* – 4 = −*y* = .

(b) Intersection where 

⇒ 

(1) + (2) ⇒ 4 = 1 + *t*

⇒ *t* = 3

(2) ⇒ *λ* = −2

(3) ⇒ 3 + 4 = −5 + 6: False

These are skew lines and do not intersect.  *[7 marks]*

**4.** (a) ***rA*** = (3***i*** + 4.5***j***)*t* km *[1 mark]*

(b) ***rB*** = 16***i*** + 23***j*** + (−5***i*** – ***j***)*t* km

Then,  = ***rB*** – ***rA***

= 16***i*** + 23***j*** + (−5***i*** – ***j***)*t* – (3***i*** + 4.5***j***)*t*

= (16 – 8*t*)***i*** + (23 – 5.5*t*)***j*** *[3 marks]*

(c) Distance between cars = ||

= 

=  10.1 km *[2 marks]*

(d) For cars to meet, there must exist a *t* for which || = 0, or equivalently for which ||2 = 0.

(16 – 8*t*)2 + (23 – 5.5*t*)2 = 0

⇔ 256 −256*t* + 64*t*2 + 529 – 523*t* + *t*2 = 0

⇔ 377*t*2 – 2036*t* + 3140 = 0

The discriminant *D* = *b*2 – 4*ac* < 0 and therefore no solutions exist. *[4 marks]*