Math 2130 Summer2014 Test 1 (by N Harland)

[3] 1. (a) *For the curve,* $x = y^2 + z^2$, *identify the type of curve and give a sketch.*

[5] (b) *Find the projection of the intersection of* $z^2 = x^2 + y^2$ *and* $x^2 + 3y^2 + z^2 = 4$ *in the* xy*-plane.*

2. *Let* l_1 *be the line*

$$\frac{x-1}{2} = y - 2 = \frac{z-1}{3}$$

and l_2 *be the line*

$$x = 3 - 2t,\ y = 1 + t,\ z = 2 - t.$$

[3] (a) *Show that the lines are intersecting and find the point of intersection.*

[5] (b) *Find the equation of the plane containing both lines.*

[3] (c) *Find the distance from the point* $R(1, 2, 3)$ *to the plane found in part (b).*

3. *Let* l_1 *be the line*

$$\frac{x-3}{2} = y + 5 = \frac{z-1}{-2}$$

and l_2 *has parametric equations*

$$x = 1 \quad y = 3 + 2t \quad x = 1 + 2t.$$

[5] (a) *Determine whether the lines are parallel, intersecting or skew.*

[6] (b) *Find the shortest distance between the lines.*

[6] 4. *Find a parametric representation for the curves of intersection of* $x^2 + y^2 = z^2$ *and* $x^2 + y^2 + z^2 = 8$ *directed so that* x *increases when* y *is positive. Justify your answer. Assume* $z \geq 0$.

5. *Let a curve* C *be defined by a position vector* $\mathbf{r_1}(t) = \langle t, 2 - t, 3 - 2t^2 \rangle$ *and let a curve* D *be defined by a position vector* $\mathbf{r_2}(s) = \langle s, s^2, s^3 \rangle$.

[4] (a) *Find parametric equations for the tangent line to* $\mathbf{r_1}(t)$ *at the point* $(0, 2, 3)$.

[6] (b) *Find the point of intersection of the two curves and find the cosine of the angle between the curves at that point.*

[4] (c) *Set up, but don't evaluate an integral to find the length of the curve* C *from the point* $(0, 2, 3)$ *to* $(2, 0, -5)$.