Math 20550 - Summer 2016
Motion in Space and Functions of Several Variables
June 21, 2016

Problem 1. *Find an equation for the line segment from* $P = (1, 6, 8)$ *to* $Q = (3, 1, 2)$.

Problem 2. *Sketch the graph of*

$$\mathbf{r}(t) = \langle 3\cos t, 2\sin t \rangle .$$

Be sure to indicate the direction of increasing t*-values.*

Problem 3. *Find the domain of the function*

$$\mathbf{r}(t) = \left\langle \ln(t1), \cos t, \sqrt{164t^2} \right\rangle .$$

Problem 4. *Find a parametrization for the intersection of the paraboloid* $z = x^2 + y^2$ *and the plane* $x + y = 0$.

Problem 5. *Determine the interval(s) on which the function*

$$\mathbf{r}(t) = \left\langle e^t, \tan t, \ln|t| \right\rangle$$

is continuous.

Problem 6. *Show that the curve* $\mathbf{r}(t) = (\cos t)\hat{\imath} + (\sin t)\hat{\jmath} + (\sin(2t))\hat{k}$ *lies on the hyperbolic paraboloid* $z = 2xy$.

Problem 7. *The curve in the previous problem can be seen as the intersection of* $z = 2xy$ *with what other surface?*

Problem 8. *Sketch the graph of*

$$\mathbf{r}(t) = \langle \cos(\pi t), \sin(\pi t), t \rangle .$$

Be sure to indicate the direction of increasing t*-values.*

Problem 9. *Find the limit*

$$\lim_{t \longrightarrow 2} \left(2t\hat{\imath} + \frac{2}{t^2 - 1}\hat{\jmath} + \frac{1}{t}\hat{k} \right) .$$

Problem 10. *Two particles are traveling along trajectories* $\mathbf{p}(t) = \langle t^2, 9t - 20, t^2 \rangle$ *and* $\mathbf{q}(t) = \langle 3t + 4, t^2, 5t - 4 \rangle$*, respectively. Do the two particles' trajectories intersect? Do the two particles collide? (Remember that in order for them to collide, they have to be in the same place, at the same time.)*