

Finding Lines

What We're Given	How to Solve
A point and a parallel vector	$r = \text{the point expressed as a vector} + t * (\text{the parallel vector})$
A point and a perpendicular plane	Extract the normal vector from the plane equation Then $r = \text{the point} + t * \text{the normal vector}$
Two points	Subtract point B from point A & you get a parallel vector Then $r = \text{a point (choose A or B)} + t * \text{the parallel vector}$
A point and 2 other vectors that the line is perpendicular to	$r = \text{the point given} + t * (\text{the cross product of the two other points})$
Intersection of two planes & a point on the line	$r = \text{the point given} + t * (\text{the cross product of the normal vectors of the planes})$

Finding Planes

What We're Given	How to Solve
A point and a perpendicular vector	$n = \text{the perpendicular vector}$ $r_0 = \text{the point}$
A point and a perpendicular line	The direction vector of the perpendicular line is normal to the plane so... $n = \text{the direction vector of the line}$ $r_0 = \text{the point given}$
A point and a parallel plane	$n = \text{the normal vector of the plane that it's parallel to (extract it from the plane equation)}$ $r_0 = \text{the point given}$
A line and a parallel plane	Find a point on the line & extract the normal vector of the parallel plane $n = \text{the normal vector}$ $r_0 = \text{the point on the line}$
3 points	Find two nonparallel vectors (try taking B-A & C-A) $n = \text{the cross product of these two vectors found}$ $r_0 = \text{any point of A, B, or C}$
A point and a line that are both in the plane	1. Have to make sure the point doesn't lie on the line 2. If it doesn't, we can continue 3. Find two vectors that are nonparallel: - One vector: the direction vector of the line - Second vector: - solve for $t=0$ on the line; find the vector between the point we're given and the point at $t=0$ Solve for the cross product of the two (secretly the same question as "3 points" in disguise)