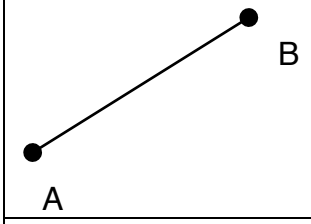
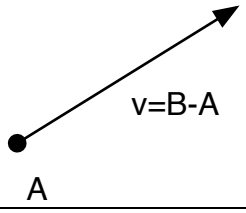
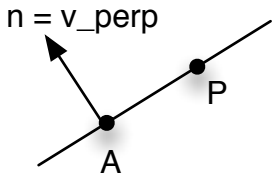
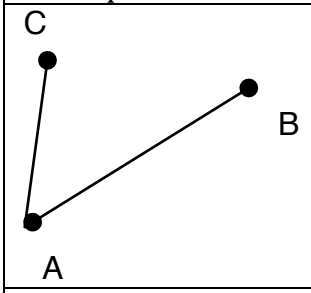
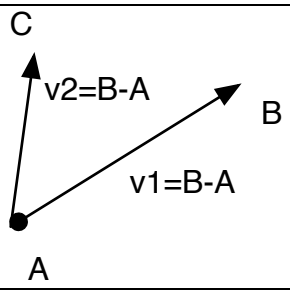
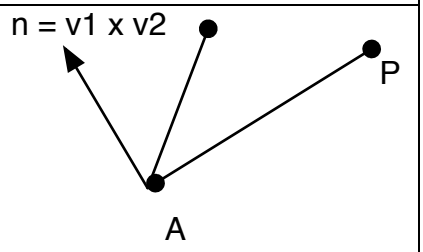
Notes on line and plane representations
Readings: Hill, chapter 4 minus 4.5.1, 4.4.2, 4.5.4, 4.6.1, all of 4.8

Line representations		
Two points	Point + vector	Point + normal
		
$P(t) = (1-t)A + tB$	$P(t) = A + tv$	$n \bullet (A - P) = 0$
Blending parametric	Vector parametric	Implicit equation
If t is in [0,1], segment; in [0,inf], ray; in [-inf,inf], line		Linear, affine, convex combo

Applications
- Distance of point to line (use n from pt+normal form)
- Resolve vector to linear combination of two vectors (use pt+vector form, plus n)
- Reflection vector (use pt+normal form)
- Tweening (use blending parametric)
- Perpendicular bisector (use pt+normal form) => midpoint displacement algorithm
- Intersection of two lines (use pt-vector & pt-vector, or pt-vector & pt-normal)

Plane representations		
Three points	Point + two vectors	Point + normal
		
$P(s,t) = sA + tB$+(1-s-t)C	$P(t) = A + sv1 + tv2$	$n \bullet (A - P) = 0$
Blending parametric	Vector parametric	Implicit equation
If s, t are in [0,1], patch; in [0,inf], half-plane; in [-inf,inf], plane		

Applications
- Distance of point to plane (use n from pt-normal form)
- Intersection of ray with plane (use vector parametric line with pt-normal plane)

Other applications of vector operations
- Angle between two vectors
- Sign of angle between two vectors
- Simplicity of polygon (use line-line intersection)
- Winding direction (use area formula for polygon – if area > 0, clockwise)
- Convexity of polygon (use cross product for adjacent lines)

- Normalize vector (find magnitude)