

Name:

Student No.:

Score:

**Show all your work on the problems. You will be graded on the correctness of your methods as well as the accuracy of your answers.**

- 1 [20pts] Two forces  $\mathbf{F}_1$  and  $\mathbf{F}_2$  with magnitudes 10lb and 5lb act on an object at a point P as shown below. Find the resultant force  $\mathbf{F}$  acting at P and its direction.
  
  
  
  
  
  
  
  
  
  
- 2 [20pts] Find the work done by a force of 20lb acting in the direction  $N50^\circ W$  ( $50^\circ$  measured from North) in moving an object 4 ft due west.
  
  
  
  
  
  
  
  
  
  
- 3 [15pts] Find the equation of the line that passes through the point  $(-2, 4, 5)$  and is parallel to the line  $x = 1 + 2t$ ,  $y = 3t$  and  $z = 5 - 7t$ .
  
  
  
  
  
  
  
  
  
  
- 4a) [25pts] Sketch the curve with the vector equation  $\mathbf{r}(t) = (\sin(t), \cos(t), t)$ .
- b) Find the equation of the tangent line to this curve at  $(0, 1, 0)$ .
- c) Find the curvature  $\kappa$  of the curve.
  
  
  
  
  
  
  
  
  
  
- 5 [20pts] A projectile is fired with an initial speed of 500m/s and angle of elevation  $30^\circ$ . Find the position function  $\mathbf{r}(t)$ .