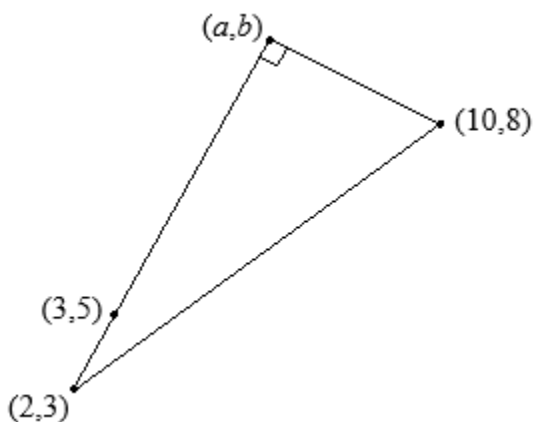


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1. The sphere $(x - 1)^2 + (y + 3)^2 + (z - 4)^2 = 58$ intersects the xz -plane and forms a circle. Find the radius of this circle. [3 pts]

Set $y=0$, so we have $(x - 1)^2 + (0 + 3)^2 + (z - 4)^2 = 58$ which is $(x - 1)^2 + 9 + (z - 4)^2 = 58$, or $(x - 1)^2 + (z - 4)^2 = 49$. Thus, the radius of the circle is 7.

2. Find the coordinates of (a, b) using projections. [5 pts]



Let \mathbf{u} = vector from $(2,3)$ to $(3,5)$, so $\mathbf{u} = \langle 1,2 \rangle$ and let \mathbf{v} be vector from $(2,3)$ to $(10,8)$, so $\mathbf{v} = \langle 8,5 \rangle$. Note that \mathbf{v} is the hypotenuse. Always project the hypotenuse onto the adjacent.

Project \mathbf{v} onto \mathbf{u} :

$$\text{proj}_{\mathbf{u}} \mathbf{v} = \left(\frac{\mathbf{u} \cdot \mathbf{v}}{\mathbf{u} \cdot \mathbf{u}} \right) \mathbf{u} = \frac{18}{5} \mathbf{u} = \left\langle \frac{18}{5}, \frac{36}{5} \right\rangle$$

Then offset from the starting point $(2,3)$, so the point (a,b) is $\left(2 + \frac{18}{5}, 3 + \frac{36}{5} \right) = \left(\frac{28}{5}, \frac{51}{5} \right) = (5.6, 10.2)$

Any correct equivalent is acceptable.

3. For what value of k are the vectors $\mathbf{u} = \langle 1,2,k \rangle$ and $\mathbf{v} = \langle k,-5,4 \rangle$ acute? Leave answer in interval form or as an inequality. [2 pts]

Dot product: $\mathbf{u} \cdot \mathbf{v} = (1)(k) + (2)(-5) + (k)(4) = k - 10 + 4k = 5k - 10$. The dot product of acute vectors will be positive, so $5k - 10 > 0 \rightarrow 5k > 10$, so $k > 2$ or the interval $(2, \infty)$.