Physics 10154 - Exam #1a

Please clearly indicate all of your answers with a box, and SHOW ALL WORK. You will not get full credit for any answer if I cannot tell how you arrived at that answer.

1. Human hair grows at a rate of about 3.3 millimeters per day. At this rate, if a single hair were allowed to continue growing for an average human lifetime (75 years), how many feet long would the hair be?

$$3.3\ \text{mm/day} \cdot \frac{365\ \text{days}}{\text{yr}} \cdot 75\ \text{yrs} = 90337.5\ \text{mm}$$

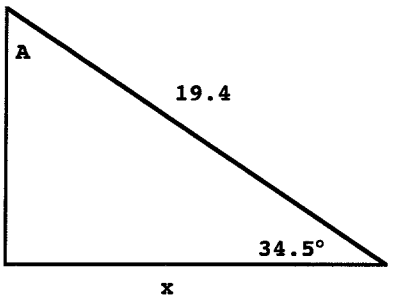
$$90337.5\ \text{mm} \cdot \frac{1\ \text{m}}{1000\ \text{mm}} \cdot \frac{3.281\ \text{ft}}{\text{m}} = \boxed{300\ \text{ft}}$$

2. A rectangular toy chest measures 3.0 feet long x 2.0 feet wide x 2.0 feet deep. Assuming it is water-tight, how many gallons of water could this chest hold?

$$V = 3 \times 2 \times 2 = 12\ \text{ft}^3$$

$$12\ \text{ft}^3 \cdot \left(\frac{12\ \text{in}}{1\ \text{ft}}\right)^3 \cdot \frac{1\ \text{gal}}{231\ \text{in}^3} = \boxed{90\ \text{gal}}$$

3. Solve for the unknown leg x and the unknown angle A in this right triangle.

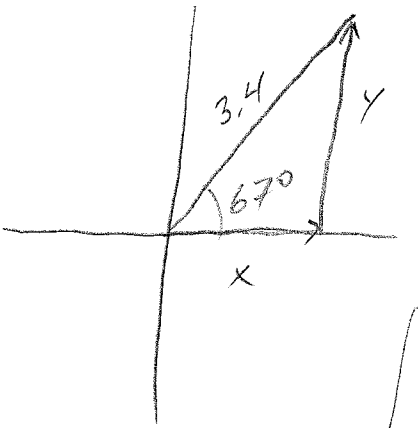


$A = 90 - 34.5 = \boxed{55.5^\circ}$

$x = 19.4 \cos 34.5^\circ$

$= \boxed{16.0}$

4. In polar coordinates, point P is at a distance of 3.4 meters from the origin at an angle of 67° above the +x axis. Express the location of point P in cartesian coordinates.



$x = 3.4 \cos 67^\circ = 1.3 \text{ m}$

$y = 3.4 \sin 67^\circ = 3.1 \text{ m}$

$\boxed{(x, y) = (1.3, 3.1) \text{ m}}$