

You are to do any three of these five questions. If you do more than three, indicate the three you wish to count towards your quiz score by circling the question number. There is no extra credit, you will only be graded out of three questions for a total of 15 points.

1. (5 pts) Determine the numeric values of s and t from the following equations,

$$\begin{aligned} t &= 4s - 5 & \rightarrow & 4t = 16s - 20 \\ 4t &= 2s + 8 & \rightarrow & -4t = -2s - 8 \end{aligned}$$

show all work!

$$0 = 14s - 28$$

$$14s = 28$$

$$s = \frac{28}{14} = 2$$

$$\begin{aligned} t &= 4s - 5 = 4(2) - 5 \\ &= 8 - 5 = 3 \end{aligned}$$

$$\boxed{s = 2, t = 3}$$

2. (5 pts) Show that $\sec^2 \theta - \tan^2 \theta$ reduces to unity (i.e., one) by making use of the trigonometric identity $1 = \sin^2 \theta + \cos^2 \theta$.

$$\sec^2 \theta - \tan^2 \theta = \left(\frac{1}{\cos \theta} \right)^2 - \left(\frac{\sin^2 \theta}{\cos^2 \theta} \right)$$

$$= \frac{1 - \sin^2 \theta}{\cos^2 \theta} = \frac{\cos^2 \theta}{\cos^2 \theta} = 1 \quad \checkmark$$

3. (5 pts) What is the slope of a straight line that connects the two points $(-1, 7)$ and $(6, 14)$? Show all steps!

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{14 - 7}{6 - (-1)} = \frac{7}{7} = \textcircled{1}$$

4. (5 pts) In astronomy, the distance modulus formula is $m - M = 5 \log d - 5$, where m is the apparent magnitude of a star, M its absolute magnitude, and d its distance in parsecs. The brightest star in the night sky is Sirius with $m = -1.46$ and $M = 1.41$. How far away is it in parsecs? Show all steps in your solution!

$$\begin{aligned} m - M &= 5 \log d - 5 \\ -1.46 - 1.41 &= 5 \log d - 5 \\ -2.87 &= 5 \log d - 5 \\ 5 \log d &= -2.87 + 5 = 2.13 \end{aligned} \quad \rightarrow \quad \begin{aligned} \log d &= \frac{2.13}{5} = 0.426 \\ d &= 10^{0.426} \\ &= \boxed{2.67 \text{ pc}} \end{aligned}$$

5. (5 pts) A right triangle has a hypotenuse of length 6.2 cm and one side of length 3.2 cm. How long is the other side? Show all steps in your solution and don't forget your units!

$$\begin{aligned} r &= 6.2 \text{ cm} \\ x &= 3.2 \text{ cm} \\ r^2 &= x^2 + y^2 \\ y^2 &= r^2 - x^2 \\ &= (6.2 \text{ cm})^2 - (3.2 \text{ cm})^2 \\ &= 38.44 \text{ cm}^2 - 10.24 \text{ cm}^2 \\ &= 28.2 \text{ cm}^2 \end{aligned} \quad \rightarrow \quad \begin{aligned} y &= \sqrt{28.2 \text{ cm}^2} \\ &= \boxed{5.3 \text{ cm}} \end{aligned}$$