

Name:

UIN:

Circle section: 804 805 806

For all quizzes, no calculators. The only thing on your desk should be your PENCIL. Circle your choices AND mark them on your QuizzStrip Scantron #815-E. The 4 problems are each worth 5 points; total: 20 points. *Please write legibly!*

1. What is the magnitude of the vector $\mathbf{v} = 5\mathbf{i} + 12\mathbf{j}$?

(a) 169

(b) 10

(c) 13

(d) 17

- (c) The magnitude is $\sqrt{5^2 + 12^2} = \sqrt{25 + 144} = \sqrt{169} = 13$.

2. Let $\mathbf{b} = \left[\frac{5}{2}, \frac{5}{2}\sqrt{3} \right]$ and $\mathbf{a} = \left[\frac{1}{2}\sqrt{3}, \frac{1}{2} \right]$. What is the scalar projection of \mathbf{b} onto \mathbf{a} ?

(a) $\frac{5}{2}$ (b) $\frac{5}{2}\sqrt{3}$

(c) 10

(d) $10\sqrt{3}$

- (b) The scalar projection is

$$\text{comp}_{\mathbf{a}}\mathbf{b} = \frac{\mathbf{a} \cdot \mathbf{b}}{\|\mathbf{a}\|} = \frac{\frac{5}{4}\sqrt{3} + \frac{5}{4}\sqrt{3}}{\sqrt{\frac{3}{4} + \frac{1}{4}}} = \frac{5}{2}\sqrt{3}.$$

3. The height in feet of a rubber bullet fired into the air is given by $y = -16t^2 + 40t + 1$ where t is in seconds. Find the average velocity of the bullet over the time interval $2.0 \leq t \leq 2.5$. Include the proper units in your answer.

- The average velocity is

$$v_{avg} = \frac{y\left(\frac{5}{2}\right) - y(2)}{\frac{5}{2} - 2} = \frac{(-100 + 100 + 1) - (-64 + 80 + 1)}{\frac{1}{2}} = -32 \text{ ft/s}.$$

4. Determine the limit $\lim_{x \rightarrow 1^+} \frac{x^2 + 1}{x - 1}$.

(a) 1

(b) $-\infty$

(c) 2

(d) ∞

- (d) As $x \rightarrow 1^+$, we see that $\frac{x^2 + 1}{x - 1} \rightarrow \frac{2}{0^+} = \infty$.