

Test 1 key

1.

- a) $\frac{4}{3}\langle -1, -2, 2 \rangle$
- b) $\frac{1}{3}\langle 1, 2, -2 \rangle$
- c) $\frac{1}{3}\langle -1, -2, 2 \rangle$
- d) $\frac{4}{3}\langle 1, 2, -2 \rangle$

2.

- a) $\langle 1 + 2t, 8 + 4t, 3 - 6t \rangle$
- b) $\langle 1 + 2t, 8 + 4t, 3 \rangle$
- c) $\langle 2 + t, 4 + 8t, 3t \rangle$
- d) $2(x - 1) + 4(y - 8) - 6(z - 3) = 0$

3.

- a) 5
- b) 4
- c) $\sqrt{32}$
- d) 4

4.

- a) $k = -6$
- b) $(-\infty, -6)$
- c) $(-6, \infty)$
- d) $k = 6$

5.

- a) $\langle 4 - 7t, 2 - t, -1 + 6t \rangle$
- b) $\langle 4 - 7t, 2 - t, -1 + 6t \rangle, 0 \leq t \leq 1$
- c) $\langle -3 + 7t, 1 + t, 5 - 6t \rangle, 0 \leq t \leq 1$
- d) $\langle 4 - 7t, 2 - t, -1 + 6t \rangle$

6.

- a) $\frac{1}{\sqrt{38}}\langle -5, 2, 3 \rangle$
- b) $\frac{1}{\sqrt{38}}\langle -5, 2, 3 \rangle$
- c) $\frac{1}{\sqrt{62}}\langle 7, 2, 3 \rangle$
- d) $\frac{1}{\sqrt{62}}\langle 7, 2, 3 \rangle$

7.

- a) The zero vector.
- b) Zero (scalar)
- c) It is $|\mathbf{u}||\mathbf{v}|$
- d) The zero vector

8.

- a) (0,7,11)
- b) (0,7,11)
- c) (0,7,11)
- d) 79.59 deg.

9.

- a) $\langle 10, 5, 75 \rangle$
- b) 75.83

- c) 48.92
d) (8,5,48)

10.

Form A: $\mathbf{PQ} = \langle -8, 3, -6 \rangle$, $\mathbf{PR} = \langle -1, -3, -5 \rangle$, $\mathbf{PQ} \times \mathbf{PR} = \langle -33, -34, 27 \rangle$.
Choose any point to evaluate, the line is $33x + 34y - 27z = 253$.

Form B: $\mathbf{PQ} = \langle -8, 0, -6 \rangle$, $\mathbf{PR} = \langle -1, -3, -5 \rangle$, $\mathbf{PQ} \times \mathbf{PR} = \langle -18, -34, 24 \rangle$.
Choose any point to evaluate, the line is $9x + 17y - 12z = 86$.

Form C: $\mathbf{PQ} = \langle -8, 0, -6 \rangle$, $\mathbf{PR} = \langle 1, -3, -5 \rangle$, $\mathbf{PQ} \times \mathbf{PR} = \langle -18, -46, 24 \rangle$.
Choose any point to evaluate, the line is $9x + 23y - 12z = 110$.

Form D: $\mathbf{PQ} = \langle -8, -2, -6 \rangle$, $\mathbf{PR} = \langle -1, -3, -5 \rangle$, $\mathbf{PQ} \times \mathbf{PR} = \langle -8, -34, 22 \rangle$.
Choose any point to evaluate, the line is $4x + 17y - 11z = 59$.

11.

- A: $\mathbf{r}(4) = \langle 32, 3, 80 \rangle$, $\mathbf{r}'(t) = \langle 8, \frac{1}{2\sqrt{t+5}}, 3t^2 + 2t \rangle$, $\mathbf{r}'(4) = \langle 8, \frac{1}{6}, 56 \rangle$. Line is $\langle 32 + 8t, 3 + \frac{1}{6}t, 80 + 56t \rangle$.
B: $\mathbf{r}(8) = \langle 64, 3, 576 \rangle$, $\mathbf{r}'(t) = \langle 8, \frac{1}{2\sqrt{t+1}}, 3t^2 + 2t \rangle$, $\mathbf{r}'(8) = \langle 8, \frac{1}{6}, 208 \rangle$. Line is $\langle 64 + 8t, 3 + \frac{1}{6}t, 576 + 208t \rangle$.
C: $\mathbf{r}(3) = \langle 24, 2, 36 \rangle$, $\mathbf{r}'(t) = \langle 8, \frac{1}{2\sqrt{t+1}}, 3t^2 + 2t \rangle$, $\mathbf{r}'(3) = \langle 8, \frac{1}{4}, 33 \rangle$. Line is $\langle 24 + 8t, 2 + \frac{1}{4}t, 36 + 33t \rangle$.
D: $\mathbf{r}(6) = \langle 48, 3, 252 \rangle$, $\mathbf{r}'(t) = \langle 8, \frac{1}{2\sqrt{t+3}}, 3t^2 + 2t \rangle$, $\mathbf{r}'(6) = \langle 8, \frac{1}{6}, 120 \rangle$. Line is $\langle 48 + 8t, 3 + \frac{1}{6}t, 252 + 120t \rangle$.

$$\begin{aligned} \text{A: } \int_0^4 \sqrt{(8)^2 + \left(\frac{1}{2\sqrt{t+5}}\right)^2 + (3t^2 + 2t)^2} dt &\approx 91.42. \\ \text{B: } \int_0^8 \sqrt{(8)^2 + \left(\frac{1}{2\sqrt{t+1}}\right)^2 + (3t^2 + 2t)^2} dt &\approx 588.61. \\ \text{C: } \int_0^3 \sqrt{(8)^2 + \left(\frac{1}{2\sqrt{t+1}}\right)^2 + (3t^2 + 2t)^2} dt &\approx 46.69. \\ \text{D: } \int_0^6 \sqrt{(8)^2 + \left(\frac{1}{2\sqrt{t+3}}\right)^2 + (3t^2 + 2t)^2} dt &\approx 264.2. \end{aligned}$$

12.

- A: $\mathbf{u}(\text{hyp}) = \langle 3, 9 \rangle$, $\mathbf{v}(\text{adj}) = \langle 4, 6 \rangle$, $\text{proj}_{\mathbf{v}} \mathbf{u} = \frac{66}{52} \mathbf{v} = \frac{66}{52} \langle 4, 6 \rangle \rightarrow \langle \frac{92}{13}, \frac{112}{13} \rangle \approx \langle 7.07, 8.62 \rangle$.
B: $\mathbf{u}(\text{hyp}) = \langle 2, 10 \rangle$, $\mathbf{v}(\text{adj}) = \langle 4, 7 \rangle$, $\text{proj}_{\mathbf{v}} \mathbf{u} = \frac{78}{65} \mathbf{v} = \frac{78}{65} \langle 4, 7 \rangle = \langle \frac{24}{5}, \frac{42}{5} \rangle = \langle 4.8, 8.4 \rangle$.
C: $\mathbf{u}(\text{hyp}) = \langle 4, 7 \rangle$, $\mathbf{v}(\text{adj}) = \langle 2, 10 \rangle$, $\text{proj}_{\mathbf{v}} \mathbf{u} = \frac{78}{104} \mathbf{v} = \frac{3}{4} \langle 2, 10 \rangle = \langle 1.75, 7.5 \rangle$.
D: $\mathbf{u}(\text{hyp}) = \langle 4, 8 \rangle$, $\mathbf{v}(\text{adj}) = \langle 5, 5 \rangle$, $\text{proj}_{\mathbf{v}} \mathbf{u} = \frac{6}{5} \mathbf{v} = \frac{6}{5} \langle 5, 5 \rangle \rightarrow \langle 7, 8 \rangle$.
In forms A and D, account for the original starting point.

13.

- A: $\int \mathbf{v}(t) dt = \langle -\frac{1}{2} \cos(2t) + a, \frac{1}{2} e^{2t} + b, 2t^2 + c \rangle$. At $t = 0$, $\langle -\frac{1}{2} + a, \frac{1}{2} + b, c \rangle = \langle 3, 7, 2 \rangle$
so $a = \frac{7}{2}, b = \frac{13}{2}, c = 2$. Thus, $\int \mathbf{v}(t) dt = \langle -\frac{1}{2} \cos(2t) + \frac{7}{2}, \frac{1}{2} e^{2t} + \frac{13}{2}, 2t^2 + 2 \rangle$.
B: $\int \mathbf{v}(t) dt = \langle 2t^2 + a, \frac{1}{2} e^{2t} + b, -\frac{1}{2} \cos(2t) + c \rangle$. At $t = 0$, $\langle a, \frac{1}{2} + b, -\frac{1}{2} + c \rangle = \langle 3, 7, 2 \rangle$
so $a = 3, b = \frac{13}{2}, c = \frac{5}{2}$. Thus, $\int \mathbf{v}(t) dt = \langle 2t^2 + 3, \frac{1}{2} e^{2t} + \frac{13}{2}, -\frac{1}{2} \cos(2t) + \frac{5}{2} \rangle$.
C: $\int \mathbf{v}(t) dt = \langle 2t^2 + a, \frac{1}{2} e^{2t} + b, -\frac{1}{2} \cos(2t) + c \rangle$. At $t = 0$, $\langle a, \frac{1}{2} + b, -\frac{1}{2} + c \rangle = \langle 4, 1, 5 \rangle$
so $a = 4, b = \frac{1}{2}, c = \frac{11}{2}$. Thus, $\int \mathbf{v}(t) dt = \langle 2t^2 + 4, \frac{1}{2} e^{2t} + \frac{1}{2}, -\frac{1}{2} \cos(2t) + \frac{11}{2} \rangle$.
D: $\int \mathbf{v}(t) dt = \langle -\frac{1}{2} \cos(2t) + a, \frac{1}{2} e^{2t} + b, 3t^2 + c \rangle$. At $t = 0$, $\langle -\frac{1}{2} + a, \frac{1}{2} + b, c \rangle = \langle 3, 7, 2 \rangle$
so $a = \frac{7}{2}, b = \frac{20}{2}, c = 2$. Thus, $\int \mathbf{v}(t) dt = \langle -\frac{1}{2} \cos(2t) + \frac{7}{2}, \frac{1}{2} e^{2t} + \frac{20}{2}, 3t^2 + 2 \rangle$.