

1. Which of the following vectors is perpendicular to the vector $\begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix}$?

A $\begin{pmatrix} -2 \\ 3 \\ -1 \end{pmatrix}$

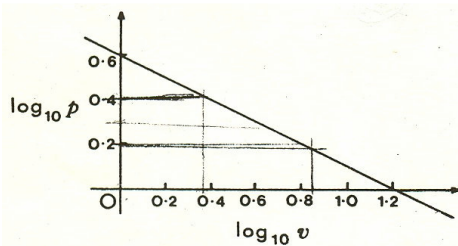
B $\begin{pmatrix} 4 \\ -3 \\ 1 \end{pmatrix}$

C $\begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$

D $\begin{pmatrix} 3 \\ 2 \\ 0 \end{pmatrix}$

E $\begin{pmatrix} 2 \\ 2 \\ 1 \end{pmatrix}$

2.



The graph illustrates the law $p = kv^n$.
The value of k is nearest to

A -0.50

B 0.60

C 1.20

D 4.0

E 16.0

3. $OP = \begin{pmatrix} 0 \\ 0 \\ 6 \end{pmatrix}$ and $OQ = \begin{pmatrix} 0 \\ 3 \\ 4 \end{pmatrix}$. The cosine of angle POQ is equal to

A $\frac{24}{61}$

B $\frac{13}{30}$

C $\frac{42}{61}$

D $\frac{4}{5}$

E $\frac{9}{10}$

4. The derivative of $(4 - 9x^4)^{\frac{1}{2}}$ is

A $-\frac{9}{2} (4 - 9x^4)^{-\frac{1}{2}}$

B $\frac{1}{2} (4 - 9x^4)^{-\frac{1}{2}}$

C $2 (4 - 9x^4)^{-\frac{1}{2}}$

D $-3x(4 - 9x^4)^{-\frac{1}{2}}$

E $-18x^3 (4 - 9x^4)^{-\frac{1}{2}}$

5. Given that $p = mv$, then $\frac{1}{2}mv^2$ can be expressed in terms of m and p as

A $\frac{p}{2m}$

B $\frac{p^2}{2m}$

C $\frac{p^2}{2m^2}$

D $\frac{p^2}{2m^2}$

E $\frac{mp}{2}$

6. Given that k is a constant of integration, then

$$\int \cos 3x \, dx \text{ equals}$$

A $\frac{1}{3} \sin 3x + k$

B $\frac{1}{3} \cos 3x + k$

C $\sin 3x + k$

D $-\sin 3x + k$

E $-3 \sin 3x + k$

7. Given that $f(x) = -\cos 2x$, $f'(x)$ equals

A $-2 \sin 2x$

B $-\sin 2x$

C $-\frac{1}{2} \sin 2x$

D $\frac{1}{2} \sin 2x$

E $2 \sin 2x$

8. $\sin \theta + \cos \theta$ is identically equal to

A 1

B $\sqrt{2} \cos \left(\theta + \frac{\pi}{4} \right)$

C $\sqrt{2} \cos \left(\theta + \frac{\pi}{4} \right)$

D $2 \cos \left(\theta + \frac{\pi}{4} \right)$

E $2 \cos \left(\theta + \frac{\pi}{4} \right)$

9. Given that $f(4x+1)^3$, then $f^{-1}(x)$ is

A $12(4x+1)^2$

B $3(3x+1)^2$

C $\frac{3}{4}(4x+1)^2$

D $192x^2$

E $12x^2$

10. The image of the line $y = 5x + 6$ under the translation

$\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ is the line

A $y = -9x$

B $y = 8x + 6$

C $y = 5x + 9$

D $y = 5x + 3$

E $y = 5x - 9$