

CPE Higher Mains Homework (9)

① Differentiate $2\sqrt[3]{x}$ with respect to x .

- A. $6\sqrt{x}$
- B. $\frac{3}{2}\sqrt[3]{x^4}$
- C. $-\frac{4}{3\sqrt[3]{x^2}}$
- D. $\frac{2}{3\sqrt[3]{x^2}}$

② When $2ax^3 + (a+1)x - 6$ is divided by $x+2$, the remainder is 2.

What is the value of a ?

- A. $\frac{5}{3}$
- B. $-\frac{4}{9}$
- C. $-\frac{5}{9}$
- D. $-\frac{5}{7}$

③ Find $\frac{dy}{dx}$ where $y = \frac{4}{x^2} + x\sqrt{x}$.

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④ Find k if $x-2$ is a factor of $x^3 + kx^2 - 4x - 12$.

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⑤ Find $f'(4)$ where $f(x) = \frac{x-1}{\sqrt{x}}$.

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⑥ The point Q divides the line joining $P(-1, -1, 0)$ to $R(5, 2, -3)$ in the ratio 2 : 1.
Find the coordinates of Q.

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⑦ Given that $y = 2x^2 + x$, find $\frac{dy}{dx}$ and hence show that $x \left(1 + \frac{dy}{dx}\right) = 2y$.

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⑧ VABCD is a pyramid with a rectangular base ABCD.

Relative to some appropriate axes,

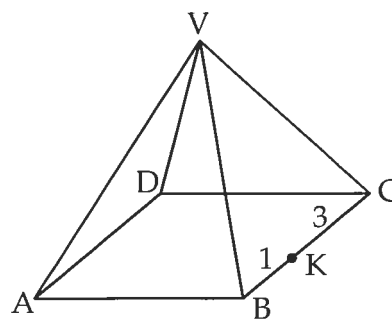
\vec{VA} represents $-7i - 13j - 11k$

\vec{AB} represents $6i + 6j - 6k$

\vec{AD} represents $8i - 4j + 4k$.

K divides BC in the ratio 1 : 3.

Find \vec{VK} in component form.



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⑨ Express $x^4 - x$ in its fully factorised form.

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⑩ (a) Write $\sin(x) - \cos(x)$ in the form $k \sin(x - a)$ stating the values of k and a where $k > 0$ and $0 \leq a \leq 2\pi$

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(b) Sketch the graph of $y = \sin(x) - \cos(x)$ for $0 \leq x \leq 2\pi$, showing clearly the graph's maximum and minimum values and where it cuts the x -axis and the y -axis.

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