

Answers to Grade Grabber 11

Answer 1

$$\begin{aligned}T &= \frac{k}{P} \\72 &= \frac{k}{2000} \\k &= 72 \times 2 \\&= 144\end{aligned}$$

$$\therefore T = \frac{144}{P}$$

When the power is 0.8 kilowatts,

$$\begin{aligned}T &= \frac{144}{0.8} \\&= 180 \text{ seconds} \quad (3 \text{ minutes})\end{aligned}$$

[4 marks]

Answer 2

$$\begin{aligned}\text{Distance} &= \sqrt{(\Delta x)^2 + (\Delta y)^2} \\&= \sqrt{(23 - 3)^2 + (16 - 1)^2} \\&= \sqrt{20^2 + 15^2} \\&= 25\end{aligned}$$

[3 marks]

Answer 3

$$\begin{aligned}\text{(i)} \quad &4.683 \times 10^6 + 8.908 \times 10^5 \\&= 5.57 \times 10^6\end{aligned}$$

[1 mark]

$$\begin{aligned}\text{(ii)} \quad &5.2281 \times 10^{-4} \times 3.735 \times 10^{-2} \\&= 1.95 \times 10^{-5}\end{aligned}$$

[1 mark]

$$\begin{aligned}\text{(iii)} \quad &\pi^{20} \\&= 8.77 \times 10^9\end{aligned}$$

[1 mark]

Answer 4

$$y^2 - x^2 = 84$$

$$(3x + 2)^2 - x^2 = 84$$

$$9x^2 + 12x + 4 - x^2 = 84$$

$$8x^2 + 12x - 80 = 0$$

$$2x^2 + 3x - 20 = 0 \quad \text{by dividing through by 4}$$

$$(2x - 5)(x + 4) = 0$$

$$\text{Either } x = \frac{5}{2} \text{ or } x = -4$$

$$\therefore \text{ The points of intersection are } \left(\frac{5}{2}, \frac{19}{2}\right), (-4, -10)$$

[5 marks]**Answer 5**

$$\begin{aligned} (3 - \sqrt{6})(\sqrt{2} + \sqrt{3}) &= 3\sqrt{2} + 3\sqrt{3} - \sqrt{12} - \sqrt{18} \\ &= 3\sqrt{2} + 3\sqrt{3} - 2\sqrt{3} - 3\sqrt{2} \\ &= \sqrt{3} \end{aligned}$$

[3 marks]**Answer 6**

$$\begin{aligned} \text{(i)} \quad \text{LHS} &= \frac{x^3 - 4}{x^2} \\ &= \frac{x^3}{x^2} - \frac{4}{x^2} \\ &= x - 4x^{-2} \\ &= \text{RHS} \quad \square \end{aligned}$$

[1 mark]

$$\text{(ii)} \quad \frac{dy}{dx} = 1 + 8x^{-3}$$

$$\text{For a turning point, } \frac{dy}{dx} = 0 \quad \Rightarrow \quad 1 + \frac{8}{x^3} = 0$$

$$\therefore x^3 + 8 = 0$$

$$x = -2 \Rightarrow \text{Turning point is } (-2, -3)$$

[4 marks]

$$\text{(iii)} \quad \frac{d^2y}{dx^2} = -24x^{-4}$$

This is negative for all values of x , zero excepted, and so the turning point found will be a maximum (corresponding to clockwise, negative, bend)

[4 marks]

Answer 7

By the cosine Rule,

$$\begin{aligned}
 c^2 &= a^2 + b^2 - 2ab \cos C \\
 &= 23^2 + 14^2 - 2 \times 23 \times 14 \times \cos 54 \\
 &= 346.466 \\
 c &= 18.6 \text{ cm}
 \end{aligned}$$

[3 marks]

Answer 8

$$\frac{x}{x-2} + \frac{4}{x+3} = 7$$

Multiply through by $(x-2)(x+3)$

$$x(x+3) + 4(x-2) = 7(x-2)(x+3)$$

$$x^2 + 3x + 4x - 8 = 7(x^2 + x - 6)$$

$$x^2 + 7x - 8 = 7x^2 + 7x - 42$$

$$6x^2 - 34 = 0$$

$$x^2 = \frac{34}{6}$$

$$x = \pm \frac{\sqrt{51}}{3}$$

[5 marks]

Answer 9

(i) Let $x = 0.272\ 727\ 272\ 727\ \dots$ in which case,

$$100x = 27.272\ 727\ 272\ 727\ \dots$$

$$x = 0.272\ 727\ 272\ 727\ \dots$$

$$\text{Subtract} \quad 99x = 27 \quad \Rightarrow x = \frac{3}{11}$$

[3 marks]

(ii) Let $x = 0.ababababababab\ \dots$

$$100x = ab.ababababababab\ \dots$$

$$x = 0.ababababababab\ \dots$$

$$\text{Subtract} \quad 99x = ab \Rightarrow \Rightarrow x = \frac{10a + b}{99}$$

[3 marks]

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