1 Find to 2 decimal places the value of

    a $\sec 23°$ **b** $\operatorname{cosec} 185°$ **c** $\cot 251.9°$ **d** $\sec(-302°)$

2 Find the exact value of

    a $\operatorname{cosec} 30°$ **b** $\cot 45°$ **c** $\sec 150°$ **d** $\operatorname{cosec} 300°$

    e $\cot 90°$ **f** $\sec 225°$ **g** $\operatorname{cosec} 270°$ **h** $\cot 330°$

    i $\sec 660°$ **j** $\operatorname{cosec}(-45°)$ **k** $\cot(-240°)$ **l** $\sec(-315°)$

3 Find to 2 decimal places the value of

    a $\cot 0.56^c$ **b** $\operatorname{cosec} 1.74^c$ **c** $\sec(-2.07^c)$ **d** $\cot 9.8^c$

4 Find in exact form, with a rational denominator, the value of

    a $\sec 0$ **b** $\operatorname{cosec} \frac{\pi}{4}$ **c** $\cot \frac{3\pi}{4}$ **d** $\sec \frac{4\pi}{3}$

    e $\operatorname{cosec} \frac{2\pi}{3}$ **f** $\cot \frac{7\pi}{2}$ **g** $\sec \frac{5\pi}{4}$ **h** $\operatorname{cosec}\left(-\frac{5\pi}{6}\right)$

    i $\cot \frac{11\pi}{6}$ **j** $\sec(-4\pi)$ **k** $\operatorname{cosec} \frac{13\pi}{4}$ **l** $\cot\left(-\frac{7\pi}{3}\right)$

5 Given that $\sin x = \frac{4}{5}$ and that $0 < x < 90°$, find without using a calculator the value of

    a $\cos x$ **b** $\tan x$ **c** $\operatorname{cosec} x$ **d** $\sec x$

6 Given that $\cos x = -\frac{5}{13}$ and that $90° < x < 180°$, find without using a calculator the value of

    a $\sin x$ **b** $\sec x$ **c** $\operatorname{cosec} x$ **d** $\cot x$

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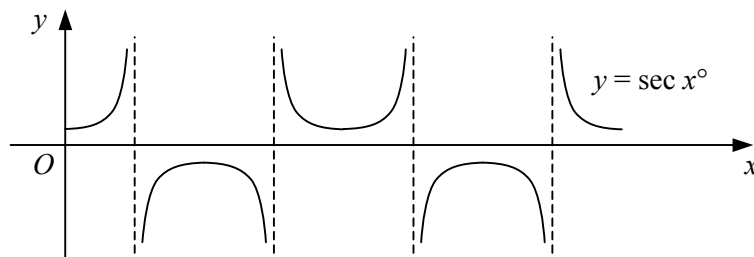

The graph shows the curve $y = \sec x°$ in the interval $0 \le x \le 720$.

    a Write down the coordinates of the turning points of the curve.

    b Write down the equations of the asymptotes.

8 Sketch each pair of curves on the same set of axes in the interval $-180° \le x \le 180°$.

    a $y = \sin x$ and $y = \operatorname{cosec} x$ **b** $y = \tan x$ and $y = \cot x$

9 Sketch each of the following curves for x in the interval $0 \le x \le 2\pi$. Show the coordinates of any turning points and the equations of any asymptotes.

    a $y = 3 \sec x$ **b** $y = 1 + \operatorname{cosec} x$ **c** $y = \cot 2x$

    d $y = \operatorname{cosec}\left(x - \frac{\pi}{4}\right)$ **e** $y = \sec \frac{1}{3}x$ **f** $y = 3 + 2 \operatorname{cosec} x$

    g $y = 1 - \sec 2x$ **h** $y = 2 \cot\left(x + \frac{\pi}{2}\right)$ **i** $y = 1 + \sec\left(x - \frac{\pi}{6}\right)$

10 Solve each equation for x in the interval $0 \le x \le 2\pi$, giving your answers in terms of π.

    a $\cot x = 1$ **b** $\sec x = 2$ **c** $\operatorname{cosec} x = \sqrt{2}$ **d** $\cot x = 0$

    e $\sec x = -1$ **f** $\operatorname{cosec} x = -2$ **g** $\cot x = -\sqrt{3}$ **h** $\sec x = -\sqrt{2}$

11 Solve each equation for θ in the interval $0 \le \theta \le 360°$, giving your answers to 1 decimal place.

    a $\sec \theta = 1.8$ **b** $\operatorname{cosec} \theta = 2.57$ **c** $\cot \theta = 1.06$ **d** $\sec \theta = -2.63$

    e $\operatorname{cosec} \theta = 3$ **f** $\cot \theta = -0.94$ **g** $\sec \theta = 1.888$ **h** $\operatorname{cosec} \theta = -1.2$

12 Solve each equation for x in the interval $-180 \le x \le 180$

    Give your answers to 1 decimal place where appropriate

    a $\operatorname{cosec} (x + 30)° = 2$ **b** $\cot (x - 57)° = 1.6$ **c** $\sec 2x° = 2.35$

    d $5 - 2 \cot x° = 0$ **e** $\sqrt{3} \sec (x - 60)° = 2$ **f** $2 \operatorname{cosec} \frac{1}{2}x° - 7 = 0$

    g $\sec (2x - 18)° = -1.3$ **h** $\operatorname{cosec} 3x° = -3.4$ **i** $\cot (2x + 135)° = 1$

13 Solve each equation for θ in the interval $0 \le \theta \le 360$.

    Give your answers to 1 decimal place where appropriate.

    a $\operatorname{cosec}^2 \theta° - 4 = 0$ **b** $\sec^2 \theta° - 2 \sec \theta° - 3 = 0$

    c $\cot \theta° \operatorname{cosec} \theta° = 6 \cot \theta°$ **d** $\operatorname{cosec} \theta° = 4 \sec \theta°$

    e $2 \cos \theta° = \cot \theta°$ **f** $5 \sin \theta° - 2 \operatorname{cosec} \theta° = 3$

14 Solve each equation for x in the interval $-\pi \le x \le \pi$.

    Give your answers to 2 decimal places.

    a $2 \operatorname{cosec}^2 x + 5 \operatorname{cosec} x - 12 = 0$ **b** $\sec x = 3 \tan x$

    c $3 \sec x = 2 \cot x$ **d** $4 + \tan x = 5 \cot x$

    e $\operatorname{cosec} x + 5 \cot x = 0$ **f** $6 \tan x - 5 \operatorname{cosec} x = 0$

15 Prove each identity.

    a $\sec x - \cos x \equiv \sin x \tan x$ **b** $(1 + \cos x)(\operatorname{cosec} x - \cot x) \equiv \sin x$

    c $\dfrac{\cot x - \cos x}{1 - \sin x} \equiv \cot x$ **d** $(\sin x + \tan x)(\cos x + \cot x) \equiv (1 + \sin x)(1 + \cos x)$

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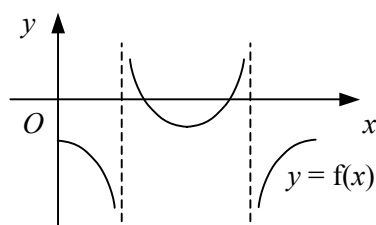
    The diagram shows the curve $y = f(x)$, where

$$f(x) \equiv 2 \cos x - 3 \sec x - 5, \ x \in \mathbb{R}, \ 0 \le x \le 2\pi.$$

    a Find the coordinates of the point where the curve meets the y-axis.

    b Find the coordinates of the points where the curve crosses the x-axis.