Angle between two lines

Solutions Main Menu

39 What is the acute angle to the nearest degree between the lines $y=2x-3$ and $3x+5y-1=0$?

(A) 32°
(B) 50°
(C) 82°
(D) 86°

40 What is the acute angle to the nearest degree between the lines $y=1-3x$ and $4x-6y-5=0$?

(A) 15°
(B) 38°
(C) 52°
(D) 75°

41 What is the acute angle to the nearest degree between the lines $y=2x-1$ and $x-3y+6=0$?

(A) 45°
(B) 54°
(C) 79°
(D) 82°

42 What is the acute angle to the nearest degree between the lines $y=7-4x$ and $2x-3y-6=0$?

(A) 26°
(B) 48°
(C) 71°
(D) 75°

43 What is the acute angle between the lines $2x-y-7=0$ and $3x-5y-2=0$?

(A) 4°24`
(B) 32° 28`
(C) 57°32`
(D) 85°36`

44 What is the acute angle between the lines $3x+4y=8$ and $2x+3y=5$?

(A) 3°11'
(B) 9°28'
(C) 70°36'
(D) 86°49'

45 What is the acute angle between the lines $y-\sqrt{3x}-6=0$ and $\sqrt{3}y-x+2=0$?

(A) 30°
(B) 45°`
(C) 60°
(D) 90°

46 $P(-2,1)$ and $Q(4,5)$ are two vertices of an acute angled triangle PQR. The side QR has the equation $x+2y-10=0$. What is the size of the angle between the sides PQ and QR correct to the nearest degree?

(A) 37°
(B) 38°
(C) 52°
(D) 53°

47 What is the acute angle to the nearest degree that the line $2x-3y+5=0$ makes with the y-axis?

(A) 27°
(B) 34°
(C) 56°
(D) 63°

48 The curves $y=x^2$ and $y=(x-2)^2$ meet at the point $(1,1)$. What is the acute angle between the tangents to curves at this point?

(A) 0°
(B) 37°
(C) 53°
(D) 65°

49 The curves $y=3x^2$ and $y=4x-x^2$ meet at the point $(0,0)$. What is the acute angle between the tangents to curves at this point?

(A) $0°$

(B) $38°40'$

(C) $68°41'$

(D) $75°58'$

50 The curves $y=\sqrt{x}$ and $y=\frac{x^2}{4}-2$ meet at the point $(4,2)$. What is the acute angle between the tangents to curves at this point?

(A) $39°$

(B) $41°$

(C) $49°$

(D) $51°$

Angle between two lines		Main Menu
	Solution	**Criteria**
39	For $y=2x-3$ then $m_1=2$ For $3x+5y-1=0$ then $m_2=-\frac{3}{5}$ $\tan\theta=\left\lvert\frac{m_1-m_2}{1+m_1m_2}\right\rvert$ $=\left\lvert\frac{2+\frac{3}{5}}{1+2\times-\frac{3}{5}}\right\rvert$ $=\left\lvert\frac{\frac{13}{5}}{-\frac{1}{5}}\right\rvert$ $=13$ $\theta=85.601294..\approx 86^\circ$	1 Mark: D
40	For $y=1-3x$ then $m_1=-3$ For $4x-6y-5=0$ then $m_2=\frac{2}{3}$ $\tan\theta=\left\lvert\frac{m_1-m_2}{1+m_1m_2}\right\rvert$ $=\left\lvert\frac{-3-\frac{2}{3}}{1+-3\times\frac{2}{3}}\right\rvert$ $=\left\lvert\frac{-\frac{11}{3}}{-1}\right\rvert$ $=\frac{11}{3}$ $\theta=74.7448813..\approx 75^\circ$	1 Mark: D
41	For $y=2x-1$ then $m_1=2$ For $x-3y+6=0$ then $m_2=\frac{1}{3}$ $\tan\theta=\left\lvert\frac{m_1-m_2}{1+m_1m_2}\right\rvert$ $=\left\lvert\frac{2-\frac{1}{3}}{1+2\times\frac{1}{3}}\right\rvert$ $=\left\lvert\frac{\frac{5}{3}}{\frac{5}{3}}\right\rvert$ $=1$ $\theta=45^\circ$	1 Mark: A

42	For $y=7-4x$ then $m_1=-4$ For $2x-3y-6=0$ then $m_2=\frac{2}{3}$ $\tan\theta=\left\lvert\frac{m_1-m_2}{1+m_1m_2}\right\rvert$ $=\left\lvert\frac{-4-\frac{2}{3}}{1+-4\times\frac{2}{3}}\right\rvert$ $=\frac{14}{5}$ $\theta=70.34617594...\approx 71^\circ$	1 Mark: C
43	For $2x-y-7=0$ then $m_1=2$ For $3x-5y-2=0$ then $m_2=\frac{3}{5}$ $\tan\theta=\left\lvert\frac{m_1-m_2}{1+m_1m_2}\right\rvert$ $=\left\lvert\frac{2-\frac{3}{5}}{1+2\times\frac{3}{5}}\right\rvert=\frac{7}{11}$ $\theta=32.47119229...\approx 32^\circ 28'$	1 Mark: B
44	For $3x+4y=8$ then $m_1=-\frac{3}{4}$ For $2x+3y=5$ then $m_2=-\frac{2}{3}$ $\tan\theta=\left\lvert\frac{m_1-m_2}{1+m_1m_2}\right\rvert$ $=\left\lvert\frac{-\frac{3}{4}--\frac{2}{3}}{1+-\frac{3}{4}\times-\frac{2}{3}}\right\rvert=\frac{1}{18}$ $\theta=3.17983012...\approx 3^\circ 11'$	1 Mark: A
45	For $y-\sqrt{3x}-6=0$ then $m_1=\sqrt{3}$ For $\sqrt{3}y-x+2=0$ then $m_2=\frac{1}{\sqrt{3}}$ $\tan\theta=\left\lvert\frac{m_1-m_2}{1+m_1m_2}\right\rvert$ $=\left\lvert\frac{\sqrt{3}-\frac{1}{\sqrt{3}}}{1+\sqrt{3}\times\frac{1}{\sqrt{3}}}\right\rvert$ $=\frac{\frac{3-1}{\sqrt{3}}}{2}=\frac{1}{\sqrt{3}}$ $\theta=30^\circ$	1 Mark: B

46	Gradient between $P(-4,1)$ and $Q(4,5)$. $m_1 = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{5-1}{4-(-4)}$ $= \frac{4}{8} = \frac{1}{2}$ For $x+2y-10=0$ then $m_2 = -\frac{1}{2}$ $\tan \angle PQR = \left\lvert \frac{m_1 - m_2}{1+m_1 m_2} \right\rvert$ $= \left\lvert \frac{\frac{1}{2} - (-\frac{1}{2})}{1+\frac{1}{2}\times(-\frac{1}{2})} \right\rvert$ $= \left\lvert \frac{1}{\frac{3}{4}} \right\rvert = \frac{4}{3}$ $\angle PQR = 53.13010235.. \approx 53^\circ$	1 Mark: D
47	For $2x-3y+5=0$ then $m = \frac{2}{3}$ Angle the line makes with the x-axis $\tan\theta = \frac{2}{3}$ $\theta = 33.69006753... \approx 34^\circ$ Angle the line makes with the y-axis $90^\circ - 34^\circ = 56^\circ$	1 Mark: C
48	$y = x^2$ $\quad\quad$ $y = (x-2)^2$ $\frac{dy}{dx} = 2x$ $\quad\quad$ $\frac{dy}{dx} = 2(x-2)$ At (1,1) then $m_1 = 2$ and $m_2 = -2$ $\tan\theta = \left\lvert \frac{m_1 - m_2}{1+m_1 m_2} \right\rvert$ $= \left\lvert \frac{2--2}{1+2\times-2} \right\rvert$ $= \frac{4}{3}$ $\theta = 53.13010235... \approx 53$	1 Mark: C

49	$y = 3x^2$ $\quad\quad$ $y = 4x - x^2$ $\frac{dy}{dx} = 6x$ $\quad\quad$ $\frac{dy}{dx} = 4-2x$ At (0,0) then $m_1 = 0$ and $m_2 = 4$ $\tan\theta = \left\lvert \frac{m_1 - m_2}{1+m_1 m_2} \right\rvert$ $= \left\lvert \frac{0-4}{1+0\times4} \right\rvert$ $= 4$ $\theta = 75.96375653... \approx 75^\circ 58'$	1 Mark: D
50	$y = \sqrt{x}$ $\quad\quad$ $y = \frac{x^2}{4} - 2$ $\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}} = \frac{1}{2\sqrt{x}}$ $\quad\quad$ $\frac{dy}{dx} = \frac{1}{2}x$ At (4,2) then $m_1 = \frac{1}{4}$ and $m_2 = 2$ $\tan\theta = \left\lvert \frac{m_1 - m_2}{1+m_1 m_2} \right\rvert$ $= \left\lvert \frac{\frac{1}{4}-2}{1+\frac{1}{4}\times2} \right\rvert$ $= \frac{7}{6}$ $\theta = 49.39870535... \approx 49$	1 Mark: C