BAB 6 NISBAH & GRAF FUNGSI TRIGONOMETRI
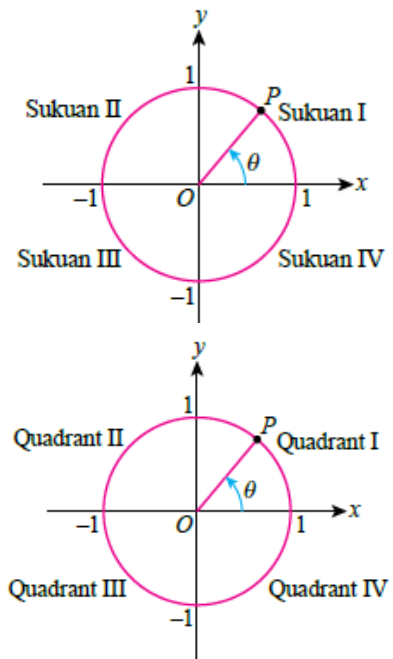
CHAPTER 6 RATIOS & GRAPH OF TRIGONOMETRIC FUNCTIONS

1. Diberi titik *P* ialah satu titik yang bergerak di sepanjang lilitan bulatan unit dan *θ* ialah sudut yang terbentuk oleh jejari bulatan unit, OP dari paksi-x yang positif mengikut arah lawan jam. Didapati bahawa:
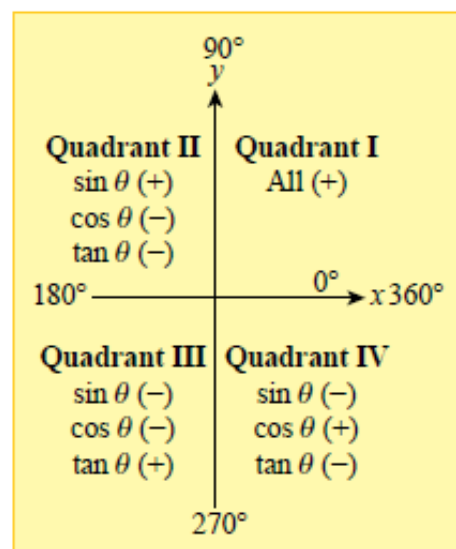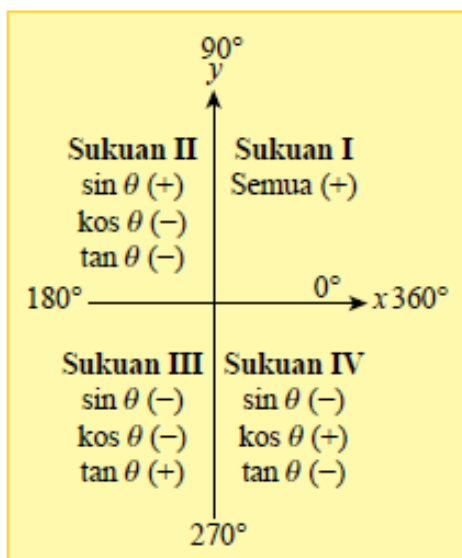   *It is given that P is a point that moves along the circumference of the unit circle and θ is the angle formed by the radius of the unit circle, OP, from the positive x-axis in an anticlockwise direction. It is found that:*

   a) Titik P berada dalam sukuan I apabila 0° < *θ* < 90°,
      Point P is in quadrant I when 0° < θ < 90°,
   b) Titik P berada dalam sukuan II apabila 90° < *θ* < 180°,
      Point P is in quadrant II when 90° < θ < 180°
   c) Titik P berada dalam sukuan III apabila 180° < *θ* < 270°,
      Point P is in quadrant III when 180° < θ < 270°
   d) Titik P berada dalam sukuan IV apabila 270° < *θ* < 360°,
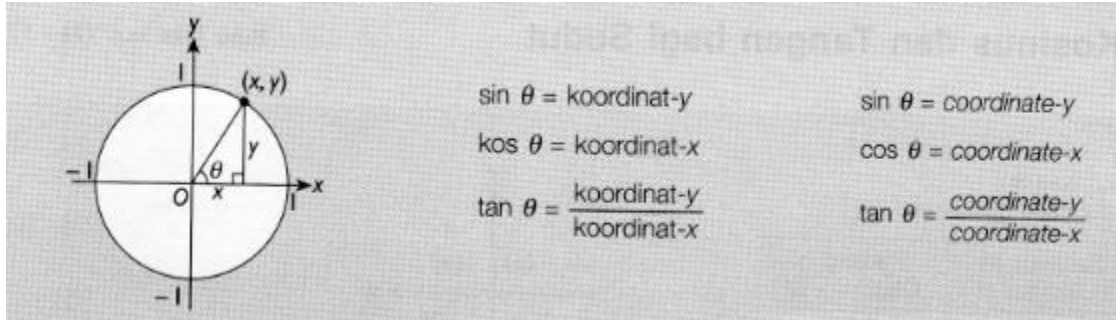   *Point P is in quadrant IV when 270° < θ < 360°*

2. Hubungan antara fungsi sinus, kosinus dan tangen bagi sudut dalam sukuan I, II, III dan IV adalah seperti berikut:
   The relationship between the function of sine, cosine and tangent for angles in quadrants I, II, III and IV can be summarised as follows:
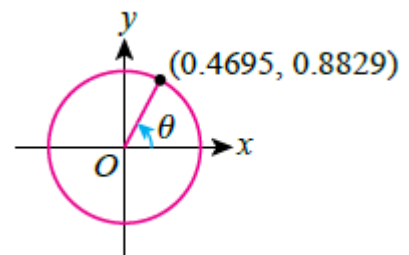
3.

sin θ = koordinat-y		sin θ = coordinate-y	
kos θ = koordinat-x		cos θ = coordinate-x	
$\tan \theta = \dfrac{koordinat\text{-}y}{koordinat\text{-}x}$		$\tan \theta = \dfrac{coordinate\text{-}y}{coordinate\text{-}x}$	

Sukuan I Quadrant I	Sukuan II Quadrant II	Sukuan III Quadrant III	Sukuan IV Quadrant IV
$sin\ \theta = +y$ $cos/kos\ \theta = +x$ $tan\ \theta = +\dfrac{y}{x}$	$sin\ \theta = +y$ $cos/kos\ \theta = -x$ $tan\ \theta = -\dfrac{y}{x}$	$sin\ \theta = -y$ $cos/kos\ \theta = -x$ $tan\ \theta = +\dfrac{y}{x}$	$sin\ \theta = -y$ $cos/kos\ \theta = +x$ $tan\ \theta = -\dfrac{y}{x}$

4. Contoh 1 / *Example 1*
    Tentukan nilai sin θ, kos θ dan tan θ.
    Determine the values of sin θ, cos θ, and tan θ.

(0.4695, 0.8829)

5. Contoh 2 / *Example 2*
   Tentukan nilai sin θ, kos θ dan tan θ.
   Determine the values of sin θ, cos θ, and tan θ

$(-0.8387, -0.5446)$

6. Contoh 3 / *Example 3*
   Tentukan nilai sin θ, kos θ dan tan θ.
   Determine the values of sin θ, cos θ, and tan θ

-0.3402

-0.9403

7. Contoh 4 / *Example 4*
    Tentukan nilai sin θ, kos θ dan tan θ.
    Determine the values of sin θ, cos θ, and tan θ

(0.5592, −0.8290)

8. Contoh 5 / *Example 5*
    Tentukan nilai sin θ, kos θ dan tan θ.
    Determine the values of sin θ, cos θ, and tan θ

(−0.5, 0.866)

9. Contoh 6 / *Example 6*
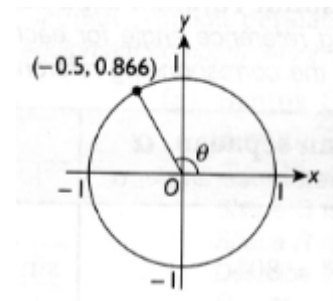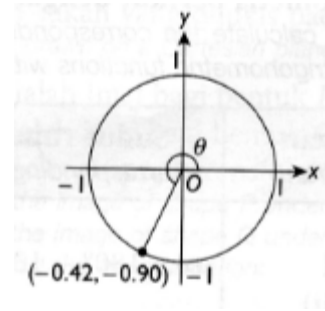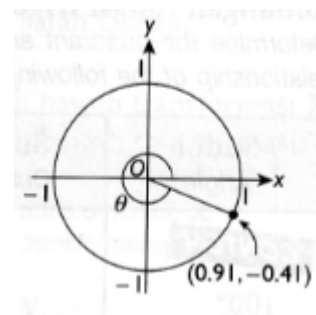   Tentukan nilai sin θ, kos θ dan tan θ.
   Determine the values of sin θ, cos θ, and tan θ

10. Contoh 7 / *Example 7*
    Tentukan nilai sin θ, kos θ dan tan θ.
    Determine the values of sin θ, cos θ, and tan θ

11. Contoh 8 / *Example 8*

Diberi bahawa 0° ≤ θ ≤ 360°, hitung sudut, θ, bagi setiap yang berikut. Bundarkan jawapan kepada 2 tempat perpuluhan.

Given that 0° ≤ θ ≤ 360°, calculate angle, θ, for each of the following. Round off the answer to 2 decimal places.

a) sin θ = 0.8090	b) kos/cos θ = 0.3421
c) tan θ = 2.2451	d) kos/cos θ = -0.4201
e) tan θ = -1.4115	f) sin θ = -0.2109

12. Contoh 9 / *Example 9*

Rajah menunjukkan dua segi tiga bersudut tegak, *KQP* dan *KLN*. *KLM* ialah garis lurus dan *KP = PN*

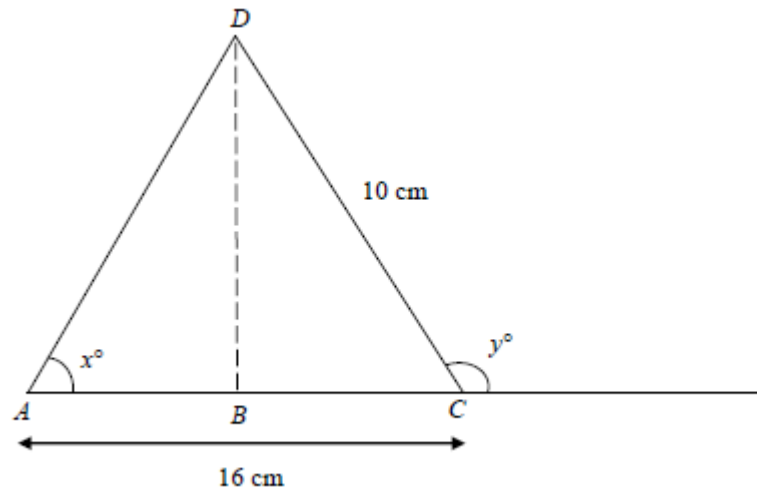*Diagram shows two right-angled triangles, KQP and KLN. KLM is a straight line and KP = PN.*

Diberi bahawa *kos* $\angle QKP = \frac{4}{5}$, cari panjang, dalam cm, bagi *NL*.

Given that cos $\angle QKP = \frac{4}{5}$, find the length, in cm, of NL.

13. Contoh 10 / *Example 10*
Rajah menunjukkan sebuah segi tiga *ACD*.
Diagram shows a triangle *ACD*.

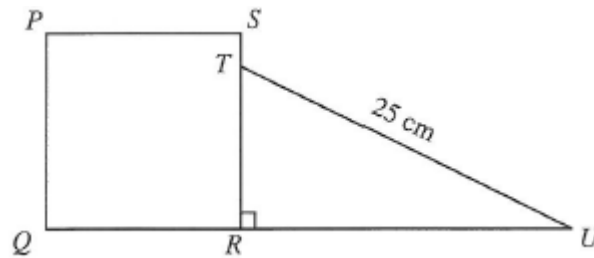Diberi bahawa *BD* ialah paksi simetri bagi segi tiga *ACD*. *B* ialah titik tengah *AC*.
Cari nilai kos $x°$ + tan $y°$.
It is given that BD is the symmetrical axis of triangle ACD. B is the midpoint of the line AC. Find the value of cos $x°$ + tan $y°$.

14. Contoh 11 / *Example 11*

Rajah menunjukkan sebuah segi empat sama *PQRS* dan sebuah segi tiga bersudut tegak *TRU*.
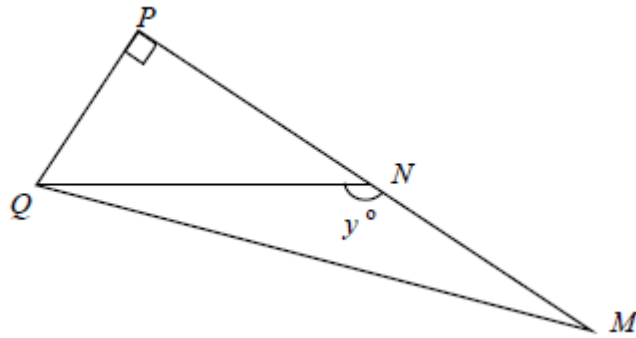*Diagram shows a square PQRS and a right-angled TRU.*

Diberi bahawa luas segi empat sama itu ialah 324 cm² dan *ST* : *TR* = 1 : 5. Cari nilai bagi tan ∠*RUT*.
It is given the area of the square is 324 cm² and ST : TR = 1 : 5. Find the value of tan ∠RUT.

15. Contoh 12 / *Example 12*

Dalam rajah, *MPQ* ialah sebuah segi tiga bersudut tegak.
In diagram, MPQ is a right-angled triangle.

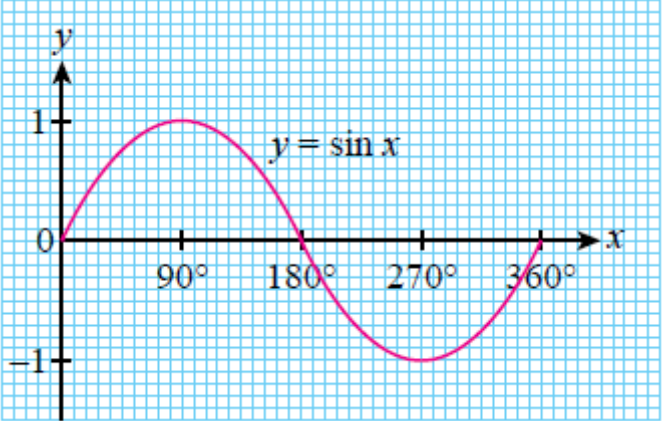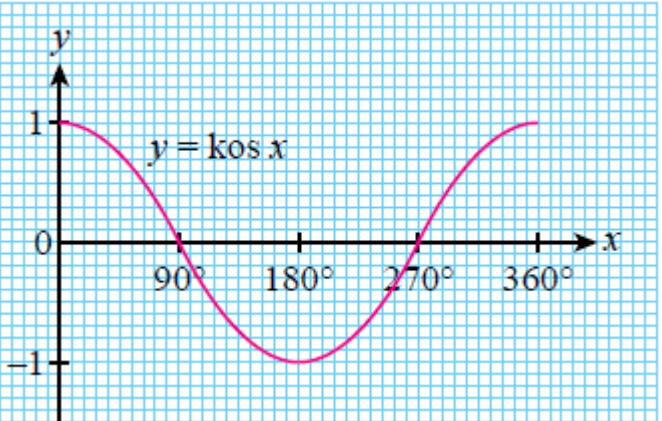Diberi bahawa QN = 13 cm, MP = 24 cm dan N ialah titik tengah MNP. Cari nilai $\tan y°$.

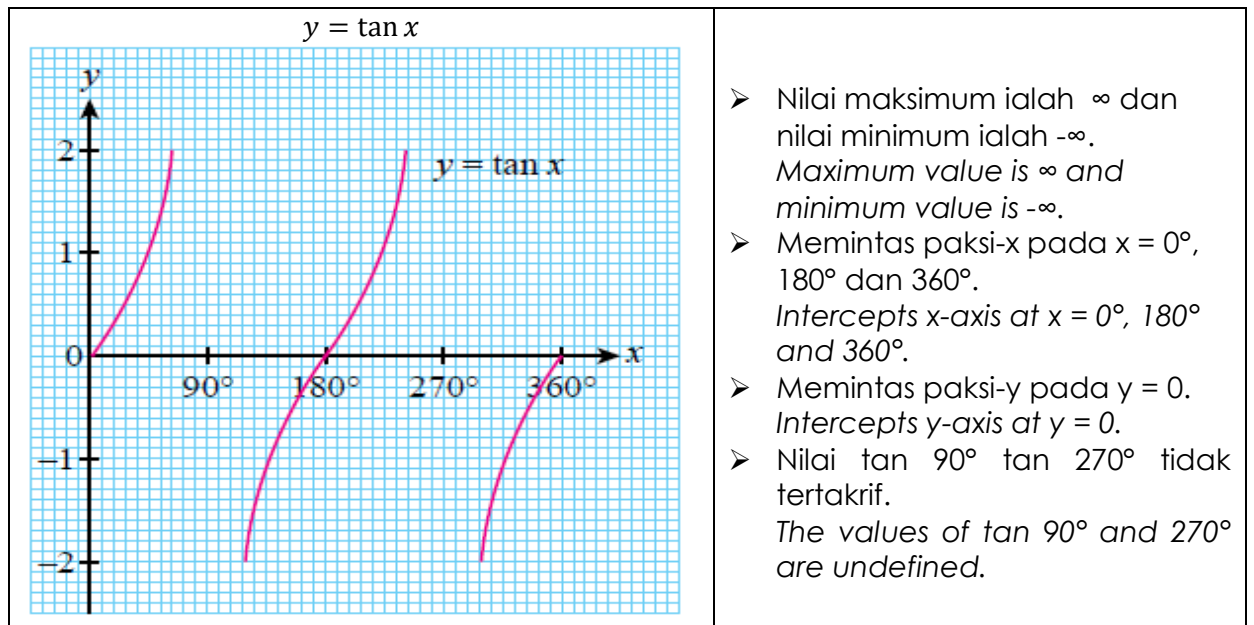*It is given that QN = 13 cm, MP = 24 cm and N is the midpoint of MNP. Find the value of $\tan y°$.*

6.2 GRAF FUNGSI SINUS, KOSINUS DAN TANGEN
GRAPH OF SINE, COSINE AND TANGENT

16. Ciri-ciri graf sinus, kosinus dan tangen adalah seperti berikut:
    The characteristics of the graph of sine, cosine and tangent are as follows:

$y = \sin x$	
	➢ Mempunyai nilai maksimum 1 apabila x = 90° dan nilai minimum -1 apabila x = 270°. *Has a maximum value of 1 when x = 90° and a minimum value of -1 when x = 270°.* ➢ Memintas paksi-x pada x = 0°, 180° dan 360°. *Intercepts x-axis at x = 0°, 180° dan 360°.* ➢ Memintas paksi-y pada y = 0 *Intercepts y-axis at y = 0.*
$y = \cos x$	
	➢ Mempunyai nilai maksimum 1 apabila x = 0° dan 360° dan nilai minimum -1 apabila x = 180°. *Has a maximum value of 1 when x = 90° and 360° and a minimum value of -1 when x = 180°.* ➢ Memintas paksi-x pada x = 90° dan 270°. *Intercepts x-axis at x = 90° dan 270°.* ➢ Memintas paksi-y pada y = 1. *Intercepts y-axis at y = 1.*

$y = \tan x$

➤ Nilai maksimum ialah ∞ dan nilai minimum ialah -∞.
  Maximum value is ∞ and minimum value is -∞.
➤ Memintas paksi-x pada x = 0°, 180° dan 360°.
  Intercepts x-axis at x = 0°, 180° and 360°.
➤ Memintas paksi-y pada y = 0.
  Intercepts y-axis at y = 0.
➤ Nilai tan 90° tan 270° tidak tertakrif.
  The values of tan 90° and 270° are undefined.

17. Contoh 13 / *Example 13*
   Lakarkan graf $y = \sin x$ dengan keadaan $90° \leq x \leq 270°$.
   Sketch the graph for $y = \sin x$ where $90° \leq x \leq 270°$.

18. Contoh 14 / *Example 14*
   Lakarkan graf $y = \cos x$ dengan keadaan $45° \leq x \leq 225°$.
   Sketch the graph for $y = \cos x$ where $45° \leq x \leq 225°$.

19.

Sifat / Properties	$y = \sin x$	$y = \cos x$	$y = \tan x$
Nilai maksimum *Maximum value*			
Nilai minimum *Minimum value*			
Pintasan-x *x-intercept*			
Pintasan-y *y-intercept*			
Amplitud *Amplitude*			
Kala / Tempoh *Period*			

20. Bagi fungsi trigonometri $y = a \sin bx + c$, $y = a\ kos\ bx + c$ dan $y = a \tan bx + c$, nilai a mempengaruhi amplitud fungsi, nilai b mempengaruhi tempoh fungsi dan nilai c mempengaruhi kedudukan graf fungsi.
For the trigonometric functions $y = a \sin bx + c$, $y = a \cos bx + c$ and $y = a \tan bx + c$, the value of a affects the amplitude of the function, the value of b affects the period of the function and the value of c affects the position of the graph of the function.

21. Contoh 15 / *Example 15*
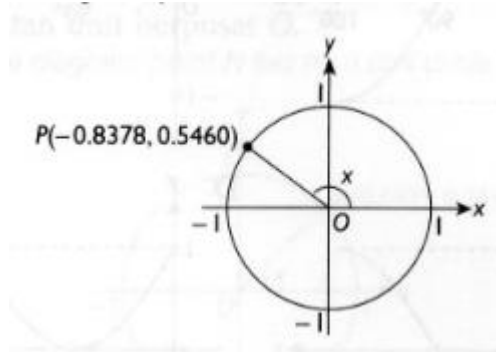Lakarkan graf setiap fungsi trigonometri yang berikut bagi $0° \leq x \leq 360°$.
Sketch each of the following trigonometric function for $0° \leq x \leq 360°$.

a) $y = \sin 2x$	b) $y = \sin x + 1$

c) $y = 3 \; kos \; x \; / \; y = 3 \cos x$	d) $y = kos \; 2x - 1 \; / \; y = \cos 2x - 1$
e) $y = 2 \tan x$	f) $y = \tan 2x$
g) $y = 1.5 \sin 4x$	h) $y = 2 \; kos \; 2x - 2 \; / \; y = 2 \cos 2x - 2$

22. Contoh 16 / *Example 16*
    Dalam rajah, titik P terletak di atas suatu bulatan unit berpusat O.
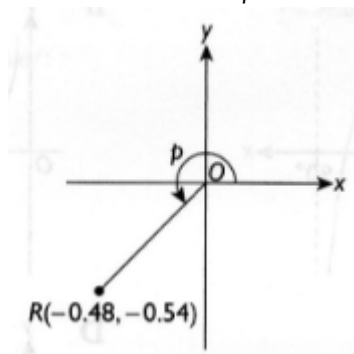   *In the diagram, point P lies on a circle unit with centre O.*

P(−0.8378, 0.5460)

Hitung nilai bagi kos *x*.
Calculate the value of cos x.

A. −0.8378   B. −0.5460
C. 0.5460   D. 0.8378

23. Contoh 17 / *Example 17*
    Rajah menunjukkan titik R pada suatu satah Cartes.
    The diagram shows a point R on a Cartesian plane.

R(−0.48, −0.54)

Hitung nilai *p*.
Calculate the value of p.

A   230° 48′
B   228° 22′
C   250° 36′
D   267° 42′

24. Contoh 18 / *Example 18*

Diberi bahawa $kos\ \theta = -\frac{12}{13}$ dengan keadaan $180° \leq \theta \leq 360°$, hitung nilai bagi $\tan \theta$.

Given that $kos\ \theta = -\frac{12}{13}$ dengan keadaan $180° \leq \theta \leq 360°$, calculate the value of $\tan \theta$.

A $-\dfrac{12}{5}$

B $-\dfrac{5}{12}$

C $\dfrac{5}{12}$

D $\dfrac{12}{5}$

25. Contoh 19 / *Example 19*

Diberi bahawa $kos\ \theta = -0.4289$ dan $0° \leq \theta \leq 360°$. Hitung nilai-nilai θ.

It is given that $kos\ \theta = -0.4289$ and $0° \leq \theta \leq 360°$. Calculate the values of θ.

A   64° 36′, 145° 24′

B   64° 36′, 244° 36′
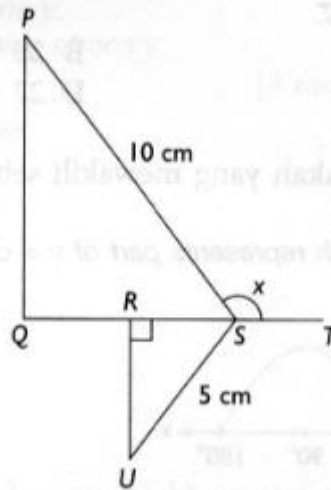
C   115° 24′, 244° 36′

D   244° 36′, 295° 24′

26. Contoh 20 / *Example 20*
Rajah di bawah menunjukkan dua segi tiga bersudut tegak. *QRST* ialah garis lurus dan *QR = RS*.
The diagram shows two right-angled triangles. QRST is a straight line and QR = RS.

Diberi sin $\angle RUS = \frac{3}{5}$, hitung nilai bagi tan x.

Given sin $\angle RUS = \frac{3}{5}$, calculate the value of tan x.
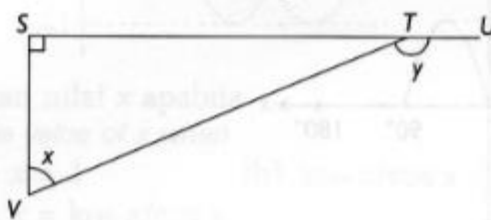
A $-\frac{5}{4}$ B $-\frac{4}{3}$

C $\frac{4}{3}$ D $\frac{5}{4}$

27. Contoh 21 / *Example 21*
Dalam rajah, STU ialah garis lurus.
In the diagram, STU is a straight line.

Diberi sin $x = \frac{12}{13}$, hitung nilai bagi *kos y*.

Given sin $x = \frac{12}{13}$, calculate the value of *cos y*.
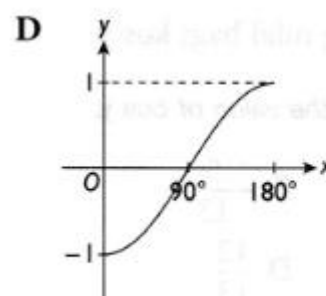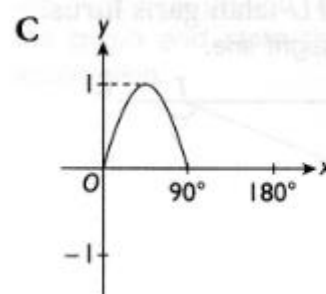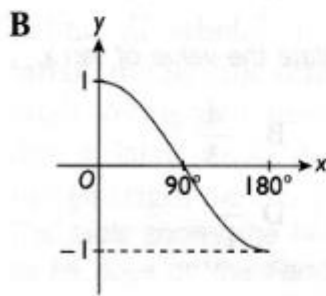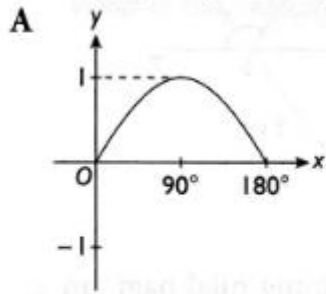
A $-\frac{12}{13}$ B $-\frac{5}{13}$

C $\frac{5}{13}$ D $\frac{12}{13}$

28. Contoh 22 / *Example 22*

Graf manakah yang mewakili sebahagian daripada
$y = \text{kos } x$?
Which graph represents part of $y = \cos x$?

A

B

C

D

29. Contoh 23 / *Example 23*

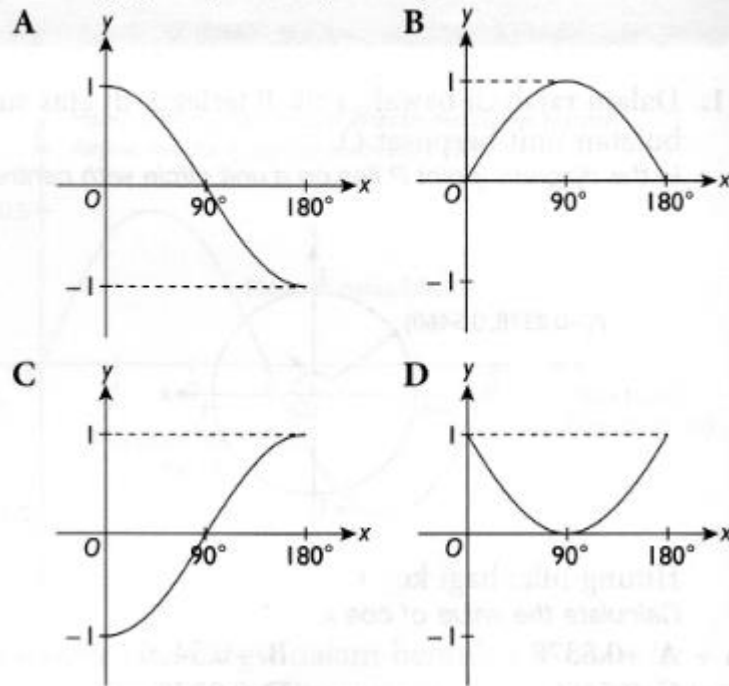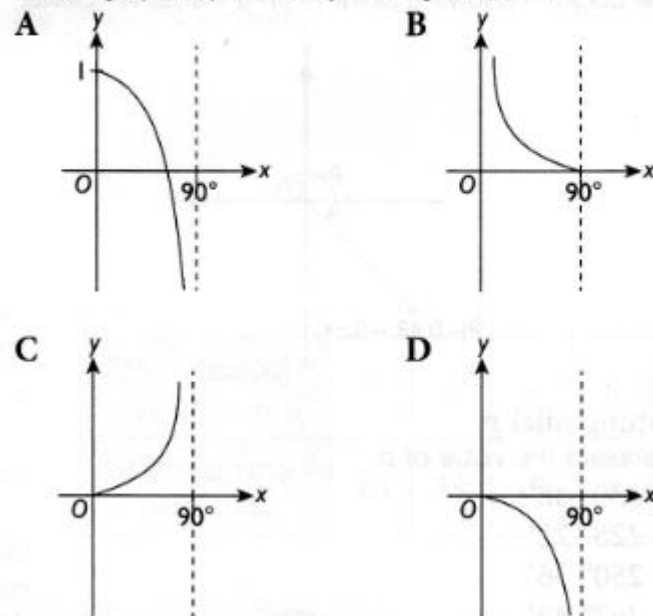Graf manakah yang mewakili sebahagian daripada $y = \sin x$?

Which graph represents part of $y = \sin x$?

30. Contoh 24 / *Example 24*

Graf manakah yang mewakili sebahagian daripada $y = \tan x$?

Which graph represents part of $y = \tan x$?

31. Contoh 25 / *Example 25*

Hitung amplitud dan tempoh bagi $y = 2 \sin 3x + 3$.
Calculate the amplitude and period of $y = 2 \sin 3x + 3$.

A Amplitud = 2, Tempoh = 120°
   Amplitude = 2, Period = 120°

B Amplitud = 2, Tempoh = 180°
   Amplitude = 2, Period = 180°

C Amplitud = 3, Tempoh = 120°
   Amplitude = 3, Period = 120°

D Amplitud = 3, Tempoh = 180°
   Amplitude = 3, Period = 180°