REG-TRIG-2324-ASM-SET 2-MATH
Suggested solutions

Multiple Choice Questions

1. C	2. B	3. B	4. D	5. C
6. A	7. D	8. A	9. B	10. D
11. C	12. A	13. D	14. A	15. D
16. D	17. B	18. C	19. A	20. B
21. D	22. A	23. A	24. D	25. D
26. B	27. D	28. C	29. C	30. C

1. $\boxed{\text{C}}$

$$\begin{aligned}&\frac{2\sin(90^\circ+\theta)-4\sin(180^\circ-\theta)}{4\cos\theta+2\sin\theta}\\&=\frac{2\cos\theta-4\sin\theta}{4\cos\theta+2\sin\theta}\\&=\frac{2-4\tan\theta}{4+2\tan\theta}\\&=\frac{2-4\left(-\frac{2}{5}\right)}{4+2\left(-\frac{2}{5}\right)}\\&=\frac{9}{8}\end{aligned}$$

2. $\boxed{\text{B}}$

$$\begin{aligned}\tan(180^\circ-\theta)&=\frac{1}{2}\\-\tan\theta&=\frac{1}{2}\\\tan\theta&=-\frac{1}{2}\end{aligned}$$

$$\begin{aligned}\frac{\sin^2\theta-\cos^2(180^\circ-\theta)}{\cos^2(180^\circ+\theta)}&=\frac{\sin^2\theta-\cos^2\theta}{\cos^2\theta}\\&=\frac{\sin^2\theta}{\cos^2\theta}-1\\&=\left(-\frac{1}{2}\right)^2-1\\&=-\frac{3}{4}\end{aligned}$$

3. $\boxed{\text{B}}$

$\sin 1° \cos 89° + \sin 2° \cos 88° + \ldots + \sin 88° \cos 2° + \sin 89° \cos 1°$

$= \sin^2 1° + \sin^2 2° + \ldots + \sin^2 88° + \sin^2 89°$

$= (\sin^2 1° + \sin^2 89°) + (\sin^2 2° + \sin^2 88°) + \ldots + (\sin^2 44° + \sin^2 46°) + \sin^2 45°$

$= (\sin^2 1° + \cos^2 1°) + (\sin^2 2° + \cos^2 2°) + \ldots + (\sin^2 44° + \cos^2 44°) + \dfrac{1}{2}$

$= 1 \times 44 + \dfrac{1}{2}$

$= 44.5$

4. $\boxed{\text{D}}$

$$\begin{aligned} \tan \frac{A+B}{2} &= \tan \frac{180° - C}{2} \\ &= \tan\left(90° - \frac{C}{2}\right) \\ &= \frac{1}{\tan \frac{C}{2}} \end{aligned}$$

5. $\boxed{\text{C}}$

I. ✗. $\sin A = \sin(360° - B) = -\sin B \neq \sin B$

II. ✗.

III. ✓. $\cos A = \cos(360° - B) = \cos B$

6. $\boxed{\text{A}}$

$$\begin{aligned} (\cos\theta - \sin\theta)^2 &= \left(\frac{1}{3}\right)^2 \\ \cos^2\theta - 2\sin\theta\cos\theta + \sin^2\theta &= \frac{1}{9} \\ 1 - 2\sin\theta\cos\theta &= \frac{1}{9} \\ \sin\theta\cos\theta &= \frac{4}{9} \end{aligned}$$

7. $\boxed{\text{D}}$

$$\begin{aligned} \frac{\cos\theta + 4\sin\theta}{\cos\theta - \sin\theta} &= \frac{1 + \frac{4\sin\theta}{\cos\theta}}{1 - \frac{\sin\theta}{\cos\theta}} \\ &= \frac{1 + 4\left(\frac{3}{4}\right)}{1 - \frac{3}{4}} \\ &= 16 \end{aligned}$$

8. $\boxed{\text{A}}$

$$[\tan(270^\circ+\theta)+\tan(90^\circ+\theta)]\times[\tan(180^\circ+\theta)-\tan(360^\circ-\theta)]$$
$$=\left[\frac{-1}{\tan\theta}+\frac{-1}{\tan\theta}\right]\times[(\tan\theta)-(-\tan\theta)]$$
$$=\frac{-2}{\tan\theta}\times 2\tan\theta$$
$$=-4$$

9. $\boxed{\text{B}}$

$$[\sin(90^\circ+\theta)+1][\cos(360^\circ-\theta)-1]$$
$$=(\cos\theta+1)(\cos\theta-1)$$
$$=\cos^2\theta-1$$
$$=-\sin^2\theta$$

10. $\boxed{\text{D}}$

Let $y=1$ and $x=k$. Then $r=\sqrt{1+k^2}$.

$$\sin(270^\circ+\theta)=-\cos\theta$$
$$=-\frac{k}{\sqrt{1+k^2}}$$

11. $\boxed{\text{C}}$

$$\frac{\sin(-\theta)}{\cos 0^\circ}+\frac{\cos(270^\circ-\theta)}{\tan 225^\circ}=\frac{-\sin\theta}{1}-\frac{\sin\theta}{1}$$
$$=-2\sin\theta$$

12. $\boxed{\text{A}}$

Since $\tan\theta<0$ and $\sin\theta>0$, θ lies in quadrant II.

Let $y=2$ and $x=-1$. Then $r=\sqrt{2^2+1^2}=\sqrt{5}$.

$$\sin(\theta-270^\circ)=\cos\theta$$
$$=\frac{-1}{\sqrt{5}}$$

13. $\boxed{\text{D}}$

$$[1-\sin(180^\circ-\theta)][1+\sin(180^\circ+\theta)]=(1-\sin\theta)(1-\sin\theta)$$
$$=(1-\sin\theta)^2$$

14. $\boxed{\text{A}}$

Let $y=1$ and $r=k$.

Then $x=\sqrt{k^2-1^2}=\sqrt{k^2-1}$.

$$\tan(\theta-90^\circ)=-\frac{1}{\tan\theta}$$
$$=-1\div\frac{1}{\sqrt{k^2-1}}$$
$$=-\sqrt{k^2-1}$$

15. $\boxed{\text{D}}$

$\tan 1^\circ \tan 89^\circ + \tan 2^\circ \tan 88^\circ + \ldots + \tan 88^\circ \tan 2^\circ + \tan 89^\circ \tan 1^\circ$

$= \tan 1^\circ \times \dfrac{1}{\tan 1^\circ} + \tan 2^\circ \times \dfrac{1}{\tan 2^\circ} + \ldots + \tan 88^\circ \times \dfrac{1}{\tan 88^\circ} + \tan 89^\circ \times \dfrac{1}{\tan 89^\circ}$

$= 1 \times 89$

$= 89$

16. $\boxed{\text{D}}$

$$\begin{aligned}\frac{\sin(180^\circ - \theta)}{\cos(90^\circ + \theta)} &= \frac{\sin\theta}{-\sin\theta} \\ &= -1\end{aligned}$$

17. $\boxed{\text{B}}$

$$\begin{aligned}&\frac{1+\cos(180^\circ - \theta)}{\cos(90^\circ - \theta)} + \frac{\cos(270^\circ + \theta)}{1-\sin(90^\circ + \theta)} \\ &= \frac{1+(-\cos\theta)}{\sin\theta} + \frac{\sin\theta}{1-\cos\theta} \\ &= \frac{(1-\cos\theta)^2 + \sin^2\theta}{\sin\theta(1-\cos\theta)} \\ &= \frac{1-2\cos\theta + \cos^2\theta + \sin^2\theta}{\sin\theta(1-\cos\theta)} \\ &= \frac{2(1-\cos\theta)}{\sin\theta(1-\cos\theta)} \\ &= \frac{2}{\sin\theta}\end{aligned}$$

18. $\boxed{\text{C}}$

$$\begin{aligned}\tan(270^\circ + \theta) &= 3 \\ -\frac{1}{\tan\theta} &= 3 \\ \tan\theta &= -\frac{1}{3}\end{aligned}$$

$$\begin{aligned}&\frac{\sin^3\theta - \sin\theta\cos^2\theta + \cos\theta}{\cos\theta} \\ &= \frac{\sin\theta(\sin^2\theta - \cos^2\theta)}{\cos\theta} + 1 \\ &= \frac{\sin\theta(\sin^2\theta - \cos^2\theta)}{\cos\theta} \div \frac{\cos^3\theta}{\cos^3\theta} + 1 \\ &= \frac{\frac{\sin\theta}{\cos\theta}\left(\frac{\sin^2\theta}{\cos^2\theta} - 1\right)}{\frac{1}{\cos^2\theta}} + 1 \\ &= \frac{\tan\theta\left(\tan^2\theta - 1\right)}{\frac{\sin^2\theta + \cos^2\theta}{\cos^2\theta}} + 1 \\ &= \frac{\tan\theta\left(\tan^2\theta - 1\right)}{\tan^2\theta + 1} + 1 \\ &= \frac{19}{15}\end{aligned}$$

19. $\boxed{\text{A}}$

$$\frac{\sin(-\theta)\sin(180^\circ+\theta)}{\cos(270^\circ-\theta)\cos(180^\circ-\theta)} = \frac{-\sin\theta(-\sin\theta)}{(-\sin\theta)(-\cos\theta)}$$
$$= \tan\theta$$

20. $\boxed{\text{B}}$

$$\frac{1}{\sin(180^\circ-\theta)} - \cos(\theta-90^\circ)$$
$$= \frac{1}{\sin\theta} - \sin\theta$$
$$= \frac{1-\sin^2\theta}{\sin\theta}$$
$$= \frac{\cos^2\theta}{\sin\theta}$$

21. $\boxed{\text{D}}$

$$\sin\theta = \frac{\sqrt{17^2-15^2}}{17} = \frac{8}{17}$$
$$\sin(90^\circ+\theta) - \cos(270^\circ-\theta)$$
$$= \cos\theta - (-\sin\theta)$$
$$= \frac{15}{17} + \frac{8}{17}$$
$$= \frac{23}{17}$$

22. $\boxed{\text{A}}$

$$\frac{\sin(90^\circ+\theta)}{\sin(180^\circ-\theta)\tan(270^\circ-\theta)} - \cos^2(180^\circ-\theta)$$
$$= \frac{\cos\theta}{\sin\theta\times\frac{1}{\tan\theta}} - \cos^2\theta$$
$$= 1-\cos^2\theta$$
$$= \sin^2\theta$$

23. $\boxed{\text{A}}$

$$1 - \frac{\cos(180^\circ-\theta)\sin(180^\circ-\theta)}{\tan(90^\circ+\theta)}$$
$$= 1 - \frac{(-\cos\theta)(\sin\theta)}{-\frac{1}{\tan\theta}}$$
$$= 1 - \frac{\sin\theta\cos\theta}{\frac{\cos\theta}{\sin\theta}}$$
$$= 1-\sin^2\theta$$
$$= \cos^2\theta$$

24. $\boxed{\text{D}}$

$\cos(90° + x) + \cos(360° - x)$

$= -\sin x + \cos x$

$= \cos x - \sin x$

25. $\boxed{\text{D}}$

$$\frac{\sin(270° - x)\cos(90° - x)}{1 - \sin^2 x}$$

$$= \frac{-\cos x \sin x}{\cos^2 x}$$

$$= -\tan x$$

26. $\boxed{\text{B}}$

Since all angles are between 0° to 180°, we have $\sin A > 0$ and so $\cos B < 0$.
Thus, $\angle B$ is an obtuse angle.

27. $\boxed{\text{D}}$

$$\frac{\tan(\theta - 90°)\sin(360° - \theta)}{\cos(90° + \theta)}$$

$$= \frac{\frac{-1}{\tan\theta} \times (-\sin\theta)}{-\sin\theta}$$

$$= -\frac{1}{\tan\theta}$$

28. $\boxed{\text{C}}$

$$\frac{\sin(270° + A)\cos(-A)}{\cos(360° - A)} = \frac{-\cos A \cos A}{\cos A}$$

$$= -\cos A$$

29. $\boxed{\text{C}}$

I. ✓. $\sin x = \sin(270° - y) = -\cos y$

II. ✓. $\tan x \tan y = \tan x \tan(270° - x) = \tan x \times \dfrac{1}{\tan x} = 1$

III. ✗. $\cos(360° - y) = \cos(360° - (270° - x)) = \cos(90° + x) = -\sin x$

30. $\boxed{\text{C}}$

$$\frac{\cos(90° + x) + \sin(180° + x)}{\tan(-x)} = \frac{-\sin x - \sin x}{-\tan x}$$

$$= \frac{2\sin x}{\left(\frac{\sin x}{\cos x}\right)}$$

$$= 2\cos x$$

END OF PAPER