1) If $p$ is the period and $m$ is the minimum value of the graph of the function $f(x) = -2 + 5\sin\left(\pi x - \frac{\pi}{2}\right)$, then $p - m =$

A) 9

B) 5

C) $-5$

D) $-1$

E) 11

2) The graph of $y = -\cos\left(2x + \frac{\pi}{2}\right)$, with $-\frac{\pi}{2} \le x \le \frac{\pi}{2}$, is **increasing** on

A) $[-\frac{\pi}{4}, \frac{\pi}{4}]$

B) $[0, \frac{\pi}{2}]$

C) $[-\frac{\pi}{2}, 0]$

D) $[-\frac{\pi}{2}, -\frac{\pi}{4}]$

E) $[-\frac{\pi}{2}, \frac{\pi}{4}]$

3) The **number** of the vertical asymptotes of the graph of $y = \frac{3}{2}\sec(2x + \pi)$ in the interval $(-\pi, \pi)$ is

A) 4

B) 2

C) 3

D) 5

E) 6

4) If the adjacent figure represents part of the graph of $y = 1 + a\cot\left(kx + \frac{\pi}{2}\right)$, $k > 0$, then $a + k =$

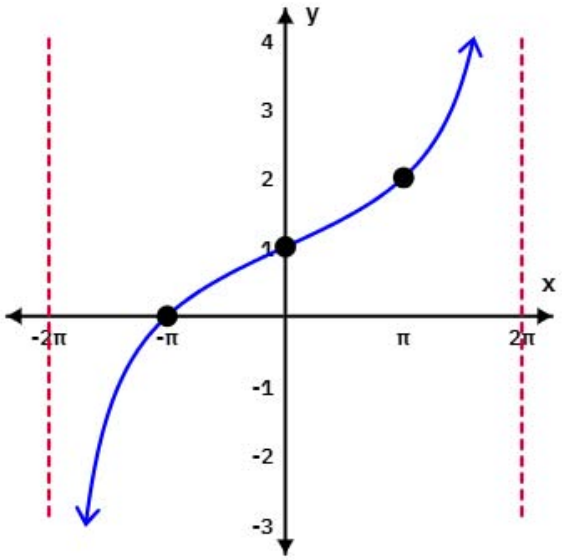
A) $-\frac{3}{4}$

B) $-\frac{1}{2}$

C) $\frac{3}{2}$

D) $\frac{5}{4}$

E) 3



5) If $x = \frac{2\pi}{3}$ and $x = -\frac{4\pi}{3}$ are two consecutive vertical asymptotes for the graph of the function $f(x) = \csc\left(bx + \frac{2\pi}{3}\right) + 3$, $b > 0$, then $b =$

A) $\frac{1}{2}$

B) $1$

C) $2$

D) $\frac{1}{3}$

E) $3$

6) $\cos^{-1}\left(\sin\frac{4\pi}{13}\right) =$

A) $\frac{5\pi}{26}$

B) $\frac{4\pi}{13}$

C) $\frac{\pi}{13}$

D) $\frac{9\pi}{13}$

E) $\frac{\pi}{26}$

7) $\cos\left(2\tan^{-1}\sqrt{3}\right) - 1 =$

A) $-\frac{3}{2}$

B) $-\frac{1}{2}$

C) $\frac{1}{2}$

D) $\frac{\sqrt{3}+2}{2}$

E) $\frac{\sqrt{3}-2}{2}$

8) $\frac{\sin x}{1-\cos x} + \frac{1-\cos x}{\sin x} =$

A) $2\csc x$

B) $\frac{1}{2}\csc x$

C) $-2\sec x$

D) $2\sec x$

E) $-\frac{1}{2}\cot x$

9) $\dfrac{\csc\beta}{\cot\beta + \tan\beta} =$

A) $\cos\beta$

B) $\sin\beta$

C) $\sec\beta$

D) $\sec\beta + \cot\beta$

E) $\csc\beta + \tan\beta$

10) If $[m, n]$ is the **range** of the function $y = 4\cos(3x) + 3\sin(3x) - 1$, then $n \cdot m =$

A) $-24$

B) $-15$

C) $-12$

D) $12$

E) $8$

11) If $\alpha$ and $\beta$ are two acute angles with $\tan\alpha = \frac{5}{3}$ and $\cot\beta = \frac{1}{4}$, then $\alpha + \beta =$

A) $135^{o}$

B) $120^{o}$

C) $180^{o}$

D) $30^{o}$

E) $60^{o}$

12) If when using the addition or subtraction formula, the expression $\cos\left(\frac{\pi}{12}\right)$ simplifies to $\frac{1}{4}\left(\sqrt{a} + \sqrt{b}\right)$, then $a + b =$

A) 8

B) 6

C) 10

D) 4

E) 2

13) If $\sin\alpha = \frac{3}{5}$ and $\cot\alpha < 0$, then $2\sin 2\alpha =$

A) $-\frac{48}{25}$

B) $-\frac{14}{25}$

C) $\frac{48}{25}$

D) $\frac{14}{25}$

E) $\frac{6}{5}$

14) If $\sqrt{\frac{1-\sin(7\pi/5)}{1-\cos(19\pi/10)}} = \tan b\left(\frac{\pi}{5}\right)$, then $b =$

A) $\frac{9}{4}$

B) $\frac{1}{4}$

C) $\frac{1}{2}$

D) $\frac{9}{2}$

E) $2$

15) The **number** of all the solutions of the equation $2\sin 3x = 1,\ 0 \le x < 2\pi,$ is

A) 6

B) 4

C) 5

D) 3

E) 2

16) The **number** of the solution(s) of the equation $\pi - 2\tan^{-1}(x) = 2\pi,$ is

A) 0

B) 1

C) 2

D) 3

E) 4

17) The **sum** of all the solution(s) of the equation $2\sec^2 x + 3\sec x = 2$, in the interval $[0°, 360°)$, is

A) 360°

B) 180°

C) 300°

D) 120°

E) 240°

18) If $A(3, -5)$ is the initial point and $B(a, b)$ is terminal point of the vector $\vec{v} = \langle -3, -4 \rangle$, then $a - b =$

A) 9

B) $-3$

C) 3

D) $-9$

E) 0

19) The directional angle of the vector $\vec{v} = \langle -2, -2\sqrt{3} \rangle$ is equal to

A) 240°

B) 225°

C) 210°

D) 30°

E) 60°

20) The angle between the vectors $\mathbf{u} = \langle 3, -3 \rangle$ and $\mathbf{v} = \langle 4, 0 \rangle$, is

A) 45°

B) 60°

C) 135°

D) 120°

E) 150°