

1) If $\frac{(\tan x + \cot x)^2}{\sin^2 x - \sin^4 x} = \sec^m x \csc^n x$, then $m + n =$

A) 8

B) 6

C) 4

D) 10

E) 12

2) Let $u = i$ and $v = 2\sqrt{3}i - 4j$ be two vectors. If θ is the direction angle of the vector $2u - \sqrt{3}v$, then $\sin \theta =$

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

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

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

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

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

3) Let u and v be two vectors such that $u = k i - j$ and v is vector of magnitude $\frac{\sqrt{2}}{2}$ and direction angle $\frac{3\pi}{4}$. If u and v are perpendicular

then $k =$

A) -1

B) 1

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

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

E) 2

4) If the range of the function $f(x) = -3 \sec(2x + 1) + 2$ is $(-\infty, m] \cup [n, \infty)$, then $m + n =$

A) 4

B) 6

C) -4

D) 0

E) 3

5) If θ is the solution of $4 \sin^2 \theta + 2 \cos^2 \theta = 3$, $\frac{3\pi}{2} \leq \theta < 2\pi$, then

$\sec \theta =$

A) $\sqrt{2}$

B) 2

C) $-\sqrt{2}$

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

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

6) $\cos^{-1} \left(\sin \left(\frac{2\pi}{7} \right) \right) =$

A) $\frac{3\pi}{14}$

B) $\frac{\pi}{14}$

C) $\frac{5\pi}{14}$

D) $\frac{2\pi}{7}$

E) $\frac{3\pi}{7}$

7) The **number** of ***x*-intercepts** of the graph of the function
 $y = -3 \cot\left(2x + \frac{\pi}{2}\right)$ over the interval $[-\pi, \pi]$, is equal to

A) 3

B) 2

C) 4

D) 5

E) 1

8) If the domain of the function $f(x) = \frac{\pi}{2} - 3 \sin^{-1}(2x - 3)$ is $[m, n]$,

then $m + n =$

A) 3

B) 4

C) 2

D) $-\pi$

E) π

9) If $\sin \theta = \frac{2\sqrt{2}}{3}$, $0 < \theta < \frac{\pi}{2}$, then $\sin^2 \frac{\theta}{2} =$

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

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

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

D) 3

E) 2

10) The minimum value of the function $y = 2 - \sqrt{3} \sin 2x + \cos 2x$ is equal to

A) 0

B) -1

C) 1

D) 2

E) -2

11) $\cos\left(2 \sin^{-1}\left(\frac{1}{4}\right)\right) =$

A) $\frac{7}{8}$

B) $\frac{8}{9}$

C) $\frac{5}{8}$

D) $\frac{3}{8}$

E) $\frac{1}{8}$

12) The graph of the function $f(x) = -2 \sec\left(\pi x + \frac{\pi}{3}\right)$, $-\frac{1}{3} < x < \frac{5}{3}$, is completely above the x -axis on the interval

A) $\left(\frac{1}{6}, \frac{7}{6}\right)$

B) $\left(-\frac{1}{3}, \frac{1}{6}\right)$

C) $\left(\frac{7}{6}, \frac{5}{3}\right)$

D) $\left(0, \frac{1}{6}\right)$

E) $\left(-\frac{1}{3}, \frac{1}{6}\right) \cup \left(\frac{7}{6}, \frac{5}{3}\right)$

13) The value of the expression $\sin 27^\circ \cos 57^\circ - \sin 63^\circ \cos 33^\circ$ is equal to

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

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

C) 0

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

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

14) $\frac{\tan x}{\tan x + \cot x} - \frac{\cot x}{\cot x + \tan x} =$

A) $-\cos 2x$

B) $\sin 2x$

C) $-\tan 2x$

D) $\cot 2x$

E) $-\sec 2x$

15) If (a, b) , $a > 0$ is the solution of the system $\begin{cases} 2x - y = 4 \\ xy = 30 \end{cases}$, then $a + b =$

A) 11

B) 9

C) 8

D) 10

E) 13

16) If $\cos \alpha = \frac{1}{\sqrt{5}}$, $0 < \alpha < \frac{\pi}{2}$ and $\cos \beta = \frac{1}{\sqrt{10}}$, $\frac{3\pi}{2} < \beta < 2\pi$, then $\tan(\alpha - \beta) =$

A) -1

B) $-\frac{1}{7}$

C) $\frac{1}{7}$

D) $\frac{1}{5}$

E) $-\frac{1}{5}$

17) $\sec \frac{25\pi}{6} - \tan (-510^\circ) =$

A) $\frac{\sqrt{3}}{3}$

B) $\frac{2\sqrt{3}}{3}$

C) $\sqrt{3}$

D) $-\frac{\sqrt{3}}{3}$

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

18) If 2π is the period of the function $f(x) = a \tan (bx)$ and $f\left(\frac{\pi}{3}\right) = -\sqrt{3}$,

then $a + b =$

A) $-\frac{5}{2}$

B) $\frac{5}{2}$

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

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

E) $-\frac{7}{2}$

19) The sum of all the solutions of the equation $\cot \theta + \tan \theta = 2$, $0 \leq \theta < 2\pi$, is equal to

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

B) $\frac{3\pi}{4}$

C) 2π

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

E) π

20) If the system of $\begin{cases} x - 3y = 1 \\ 2x + my = m + 8 \end{cases}$ is dependent, then the solution set is given by

A) $\{(3t + 1, t), t \text{ is any real number}\}$

B) $\{(t, 3t + 1), t \text{ is any real number}\}$

C) $(-\infty, \infty)$

D) \emptyset

E) $\{(t, t + 8), t \text{ is any real number}\}$

Answer Key

Testname: MAJOR #2 MATH 002 --221-- CODE 000

- 1) **A**
- 2) **A**
- 3) **A**
- 4) **A**
- 5) **A**
- 6) **A**
- 7) **A**
- 8) **A**
- 9) **A**
- 10) **A**
- 11) **A**
- 12) **A**
- 13) **A**
- 14) **A**
- 15) **A**
- 16) **A**
- 17) **A**
- 18) **A**
- 19) **A**
- 20) **A**