1. The **domain** of the function $f(x) = \log\left(\frac{x}{8-x}\right)$, in interval notation, is equal to

(a) $(0, 8)$
(b) $(-8, 8)$
(c) $(-8, \infty)$
(d) $(0, \infty)$
(e) $(-\infty, 8)$

2. If a wheel with a **diameter** of 20 centimeters is rotating at 100 revolutions per minute, then the linear speed of the wheel in centimeters per second is equal to

(a) $\frac{100\pi}{3}$
(b) $\frac{50\pi}{3}$
(c) 200
(d) $\frac{10\pi}{3}$
(e) $\frac{20\pi}{3}$

3. The graph of the function $y = 5\csc\dfrac{\pi x}{2}$ on the interval $(-4, 0)$, is increasing on

(a) $(-3,-2)\cup(-2,-1)$

(b) $(-4,-3)\cup(-1,0)$

(c) $(-3,-2)\cup(-1,0)$

(d) $(-4,-3)\cup(-2,-1)$

(e) $(-4,-2)\cup(-2,0)$

4. The graph of the function $y = \log_3|x+3|$ lies above the x-axis over the interval

(a) $(-\infty,-4)\cup(-2,\infty)$

(b) $(-\infty,\infty)$

(c) $(0,\infty)$

(d) $(-4,-3)\cup(-3,-2)$

(e) $(-4,-2)$

5. The **diameter** of a circle in which an arc length of $30\,\pi$ centimeters subtends a central angle of 135° is equal to

(a) 80 centimeters

(b) 50 centimeters

(c) $\dfrac{6\pi}{25}$ centimeters

(d) 30π centimeters

(e) 135π centimeters

6. The number of the x-intercepts of the graph of $y = 3\cot 2x$ on the interval $\left(-\dfrac{3\pi}{2}, \dfrac{3\pi}{2}\right)$ is equal to

(a) 6

(b) 5

(c) 4

(d) 2

(e) 8

7. The expression $(\log_{0.125} 2 + \log_2 0.125)$ is equal to

(a) $-\frac{10}{3}$

(b) $-\frac{3}{10}$

(c) -3

(d) $-\frac{7}{3}$

(e) $\frac{7}{3}$

8. If $\sin t = -\frac{3}{5}$ and $\sec t = \frac{5}{4}$, then $\tan t + \cot t$ is equal to

(a) $-\frac{25}{12}$

(b) $\frac{7}{12}$

(c) $-\frac{7}{12}$

(d) $\frac{25}{12}$

(e) $\frac{9}{12}$

9. The graph of the function $y = 3\cos\left(2x - \frac{\pi}{3}\right)$ on the interval $\left[\frac{\pi}{6}, \frac{7\pi}{6}\right]$ lies below the x-axis on

(a) $\left(\frac{5\pi}{12}, \frac{11\pi}{12}\right)$

(b) $\left(\frac{\pi}{6}, \frac{5\pi}{12}\right) \cup \left(\frac{2\pi}{3}, \frac{11\pi}{12}\right)$

(c) $\left(\frac{5\pi}{12}, \frac{2\pi}{3}\right) \cup \left(\frac{11\pi}{12}, \frac{7\pi}{6}\right)$

(d) $\left(\frac{2\pi}{3}, \frac{7\pi}{6}\right)$

(e) $\left(\frac{\pi}{6}, \frac{2\pi}{3}\right)$

10. Given $\sin\alpha = \frac{3}{5}$, $\frac{\pi}{2} < \alpha < \pi$, and $\cos\beta = -\frac{12}{13}$, $\pi < \beta < \frac{3\pi}{2}$, then $\tan(\alpha - \beta)$ is equal to

(a) $-\frac{56}{33}$

(b) $\frac{16}{63}$

(c) $-\frac{16}{63}$

(d) $-\frac{43}{34}$

(e) $\frac{7}{6}$

11. The solution set of the equation

$$\ln(3x+8) + \log_{e^{-1}}(2x+2) = \ln(x-2)$$

contains

(a) only one positive integer

(b) two positive integers

(c) only one negative integer

(d) two negative integers

(e) no integers

12. The value of $\sec(-300^\circ) + \tan\left(\frac{3\pi}{4}\right) + \sin 210^\circ$ is

(a) $\frac{1}{2}$

(b) $-\frac{5}{2}$

(c) $\frac{7}{2}$

(d) $-\frac{1}{2}$

(e) -1

13. The expression $\dfrac{\cot\left(\theta - \frac{3\pi}{2}\right)}{\csc\left(\theta - \frac{\pi}{2}\right)}$ is identical to

(a) $\sin\theta$

(b) $\cos\theta$

(c) $\tan\theta$

(d) $\csc\theta$

(e) $\cot\theta$

14. The sum of the solutions of the equation

$$e^{2x} - 5e^{x} + 6 = 0$$

is equal to

(a) $\ln 6$

(b) $1 + \ln 3$

(c) $1 + \ln 2$

(d) $\ln 3$

(e) $\ln 2$

15. Which one of the following statements is **TRUE**?

(a) $\sqrt{1+\tan^2 x} = -\sec x$, for $\pi < x < \dfrac{3\pi}{2}$

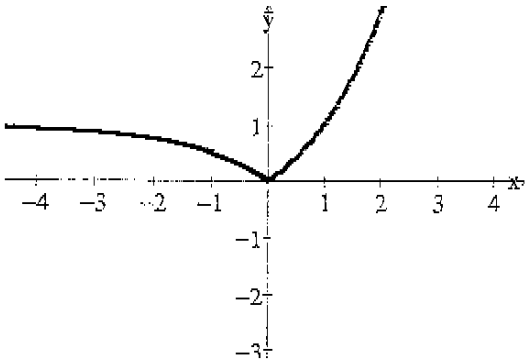
(b) $\sqrt{1-\sin^2 x} = \cos x$, for $\dfrac{\pi}{2} < x < \pi$

(c) $(\sin x + \cos x)^2 = 1$, for any real number x

(d) $|\tan x| = \tan x$, $x \neq (2n+1)\dfrac{\pi}{2}$, $n = 0, \pm 1, \pm 2, \ldots$

(e) $\tan x = \dfrac{\sin x}{\cos x}$, for any real number x

16. Which one of the following functions corresponds to the adjacent figure?



(a) $y = |2^x - 1|$

(b) $y = 2^x - 1$

(c) $y = -2^x + 1$

(d) $y = 2^{|x-1|}$

(e) $y = |2^x| - 1$

17. If $W(t) = P(x, y)$ is the wrapping function, then $W\left(-\frac{5\pi}{3}\right) =$

(a) $P\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

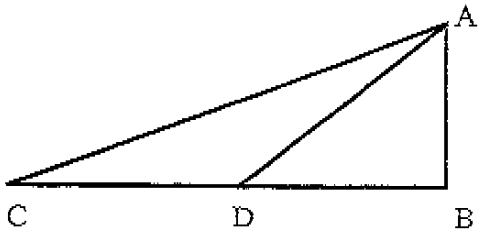
(b) $P\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

(c) $P\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$

(d) $P\left(-\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

(e) $P\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

18. In the adjacent figure, the angle of elevation from C to A is $30°$ and the angle of elevation from D to A is $60°$. If $CD = 10$ feet, then $AB =$



(a) $5\sqrt{3}$ feet

(b) 5 feet

(c) 10 feet

(d) $10\sqrt{3}$ feet

(e) $\sqrt{5}$ feet

19. The expression $\dfrac{\sin t}{\cos t + 1} + \dfrac{\cos t + 1}{\sin t}$ simplifies to

(a) $2 \csc t$

(b) $2 \cos t$

(c) $2 \tan t$

(d) $2 \cot t$

(e) $\csc t + \sec t$

20. If $0 < \theta < \dfrac{\pi}{8}$, then one of the following inequalities is **TRUE**

(a) $\cot \theta > \tan \theta$

(b) $\sin \theta > \cos \theta$

(c) $\sec \theta > \csc \theta$

(d) $\tan \theta > 1$

(e) $\sin \theta > \dfrac{1}{2}$

21. If $\log 2 = x$, then $\log 1600 + \log \frac{1}{5}$ is equal to

(a) $5x + 1$

(b) $5x - 2$

(c) $3x + 3$

(d) $3x - 2$

(e) $3x$

22. Graphically, the number of solutions of the equation

$$e^x = x + 1$$

is equal to

(a) 2

(b) 0

(c) 1

(d) 3

(e) 4

23. The expression $\dfrac{1}{1-\sin x}$ is identical to

(a) $\sec^2 x + \sec x \tan x$

(b) $\csc^2 x + \cot x$

(c) $\sec^2 x - \sec^2 x \tan x$

(d) $\csc^2 x - \csc^2 x \cot x$

(e) $\sec^2 x - \csc^2 x$

24. The sum of the **phase shift**, the **period**, and the **maximum value** of the function $f(x) = -30 \sin\left(\dfrac{10\pi}{3}x - \dfrac{4\pi}{3}\right) + 112$ is equal to

(a) 143

(b) 133

(c) 113

(d) 163

(e) 93