1. The length of an arc that subtends a central angle of 105° in a circle of diameter 30 cm is equal to

   (a) $\dfrac{35\pi}{4}$ cm

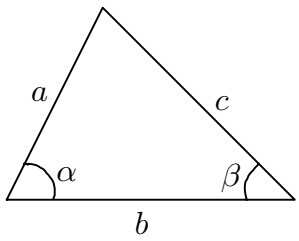
   (b) 1575 cm

   (c) 3150 cm

   (d) 30π cm

   (e) 15π cm

2. Consider the triangle given in the figure. If $\alpha = 60^\circ$, $\beta = 45^\circ$, the length of $a = 4$ feet and the length of $b = 2 + 2\sqrt{3}$ feet, then the length of c is equal to



   (a) $2\sqrt{6}$ feet

   (b) 5 feet

   (c) 4 feet

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

   (e) $3\sqrt{2}$ feet

3. Two buildings are 240 feet apart. The angle of elevation from the top of the shorter building to the top of the taller building is 30°. If the shorter building is 80 feet high, how high is the taller building?

(a) $80(\sqrt{3}+1)$ feet

(b) $80(3\sqrt{3}+1)$ feet

(c) $240\sqrt{3}$ feet

(d) $80(\sqrt{3}+2)$ feet

(e) $80\sqrt{3}$ feet

4. A car with 30-centimeter-radius tires makes a 400 kilometer trip in 3 hours. The angular speed of its tires is equal to (Hint: 1 kilometer = 10^5 cm)

(a) $\frac{4}{9} \times 10^6$ radian/hour

(b) $\frac{3}{4} \times 10^4$ radian/hour

(c) $\frac{4}{3} \times 10^6$ radian/hour

(d) $\frac{4}{3} \times 10^6$ kilometer/hour

(e) $\frac{9}{4} \times 10^4$ kilometer/hour

5. If the angle θ is in standard position and the point $P(3, -4)$ lies on its terminal side, then $\cos\theta + \tan\theta$ is equal to

(a) $\dfrac{-11}{15}$

(b) $\dfrac{3}{20}$

(c) $\dfrac{1}{15}$

(d) $\dfrac{-1}{3}$

(e) $\dfrac{1}{4}$

6. If $\sec\theta = \dfrac{2\sqrt{3}}{3}$ and $\sin\theta < 0$, then $\cot\theta + \sqrt{2}$ is equal to

(a) $\sqrt{2} - \sqrt{3}$

(b) $\sqrt{2} + \sqrt{3}$

(c) 0

(d) $2\sqrt{2}$

(e) $\sqrt{3} - \sqrt{2}$

7. If $6\tan^2\theta + 5\sec\theta$ is factored as $(a\sec\theta + b)(c\sec\theta + d)$ where a, b, c and d are integers, then $a + b + c + d$ is equal to

(a) 6

(b) 5

(c) 4

(d) 3

(e) 2

8. $$\frac{1}{\sec t - \tan t} - \frac{\sin t + 1}{\cos t} =$$

(a) 0

(b) $\dfrac{2}{\cos t(\sec t - \tan t)}$

(c) $\dfrac{2}{\cos t}$

(d) $\dfrac{-1}{\sec t - \tan t}$

(e) $\cot t$

9. If $\log_x(\log_2 8) = 2$, then x is equal to

(a) $\sqrt{3}$

(b) $\sqrt[3]{2}$

(c) 3

(d) $\frac{3}{2}$

(e) $-\sqrt{3}$

10. The solution set of the equation

$$\frac{1}{3}\log_x 64 + \frac{1}{2}\log_x 4 = 1$$

consists of

(a) one positive integer

(b) one positive and one negative real numbers

(c) one negative integer

(d) one irrational number

(e) two real numbers whose sum is equal to $\frac{1}{3}$

11. The exact value of $\log_3 5 \cdot \log_5 7 \cdot \log_7 9$ is equal to

(a) 2

(b) 7

(c) 5

(d) $\frac{3}{2}$

(e) 9

12. The domain of the function $f(x) = \ln\left(\frac{x+2}{(x-3)(x-1)}\right)$, in interval notation, is

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

(b) $(-2, 1) \cap (3, \infty)$

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

(d) $[-2, 1] \cup [3, \infty)$

(e) $(-3, -2) \cup (1, \infty)$

13. The range of the function $f(x) = -4^{-x} + 4$, in interval notation, is

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

(b) $(4, \infty)$

(c) $(-\infty, -4)$

(d) $\left(-\infty, \frac{1}{4}\right)$

(e) $\left(\frac{1}{4}, \infty\right)$

14. $\dfrac{1}{\log_{\frac{1}{y}}\left(\frac{1}{x}\right)}$ is equal to

(a) $\log_x y$

(b) $-\log_x y$

(c) $y \log x$

(d) $-\log_y x$

(e) $x \log y$

15. If $f(x) = \left(\frac{1}{2}\right)^x - 2$, then $f^{-1}(x)$ is equal to

(a) $\log_{\frac{1}{2}}(x+2)$

(b) $\log_2\left(x+\frac{1}{2}\right)$

(c) $\log_{\frac{1}{2}}(x-2)$

(d) $\log_2(x-2)$

(e) $\log_{\frac{1}{2}} x$

16. The solution set of the equation $4^{|x|} = \frac{1}{8}$ contains

(a) no solution

(b) two integers

(c) only one integer

(d) one integer and one irrational number

(e) two irrational numbers

17. The number of the x-intercepts of the graph of $y = 2\cot 2x$ on the interval $(-\pi, \pi)$ is equal to

(a) 4

(b) 3

(c) 2

(d) 1

(e) 5

18. The function $y = 3\sec\left(\frac{x}{4} - \frac{\pi}{2}\right)$ has

(a) Period $= 8\pi$, Phase Shift $= 2\pi$ to the right

(b) Period $= 2\pi$, Phase Shift $= 8\pi$ to the right

(c) Period $= 4\pi$, Phase Shift $= 2\pi$ to the left

(d) Period $= 8\pi$, Phase Shift $= \frac{\pi}{2}$ to the left

(e) Period $= 2\pi$, Phase Shift $= \frac{\pi}{2}$ to the right

19. The range of the function $y = 1 - \frac{1}{2}\csc\left(x - \frac{3\pi}{4}\right)$ is

(a) $\left(-\infty, \frac{1}{2}\right] \cup \left[\frac{3}{2}, \infty\right)$

(b) $\left(-\infty, -\frac{1}{2}\right] \cup \left[\frac{1}{2}, \infty\right)$

(c) $\left(-\infty, -\frac{1}{2}\right] \cup \left[\frac{3}{2}, \infty\right)$

(d) $\left(-\infty, \frac{1}{2}\right] \cup [1, \infty)$

(e) $\left(-\infty, -\frac{1}{2}\right] \cup [0, \infty)$

20. The graph of $y = -3\cos\frac{3x}{4}$, with $-2\pi \leq x \leq 4\pi$ is below the x-axis on the intervals

(a) $\left(-\frac{2\pi}{3}, \frac{2\pi}{3}\right)$ and $\left(2\pi, \frac{10\pi}{3}\right)$

(b) $\left(-\frac{2\pi}{3}, \pi\right)$ and $\left(\frac{3\pi}{2}, 3\pi\right)$

(c) $\left(-\frac{2\pi}{3}, \frac{4\pi}{3}\right)$ and $\left(3\pi, \frac{11\pi}{3}\right)$

(d) $\left(-\frac{2\pi}{3}, \pi\right)$ and $\left(2\pi, \frac{10\pi}{3}\right)$

(e) $\left(-\frac{2\pi}{3}, \frac{\pi}{3}\right)$ and $\left(\pi, \frac{10\pi}{3}\right)$

21. The number of zeros of the function $y = 2\sin\dfrac{2x}{3}$, in the interval $[-3\pi, 3\pi]$ is

(a) 5

(b) 6

(c) 7

(d) 4

(e) 3

22. Let $f(x) = a\cos bx$ with period $= 8$. If $f(4) = 3$, then $f(12) =$

(a) 3

(b) 4

(c) 12

(d) 8

(e) 0