3. The expression $\dfrac{\sin^3 x - \cos^3 x}{\sin x - \cos x}$ simplifies to

(a) $-1 - \sin x \cos x$

(b) $-1 + \sin x \cos x$

(c) $1 + \sin x \cos x$

(d) $1 - 2\sin x \cos x$

(e) $1 + 2\sin x \cos x$

$$\frac{(\sin x - \cos x)(\sin^2 x + \sin x \cos x + \cos^2 x)}{(\sin x - \cos x)} = 1 + \sin x \cos x$$

4. The value of $(\ln 10000)(\log \sqrt{e})(\log_3 \sqrt{5})(\log_5 9)$ is

(a) 4

(b) 8

(c) 6

(d) 1

(e) 2

$$\ln 10^4 \cdot \frac{\ln \sqrt{e}}{\ln 10} \cdot \frac{\ln \sqrt{5}}{\ln 3} \cdot \frac{\ln 9}{\ln 5}$$

$$4 \ln 10 \left(\frac{1}{2}\frac{\ln e}{\ln 10}\right) \cdot \frac{1}{2}\frac{\ln 5}{\ln 3} \cdot \frac{2\ln 3}{\ln 5}$$

$$4 \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot 2 = 2$$

7. $\dfrac{\tan 155^\circ - \cot 35^\circ}{1 + \tan 155^\circ \cot 35^\circ} =$

$\dfrac{\tan 155^\circ - \tan(90-35^\circ)}{1 + \tan 155^\circ \tan 55^\circ} = \tan 100^\circ$ (II → Θ)

$= -\tan(180-100) = -\tan(80^\circ)$

(a) $\tan 15^\circ$

(b) $\tan 20^\circ$

(c) $-\tan 80^\circ$

(d) $-\tan 25^\circ$

(e) $-\tan 75^\circ$

8. Which one of the following statements is **TRUE** for all $x > 0$, $y > 0$, $b > 0$ and $b \neq 1$?

(a) $\dfrac{\log_b x}{\log_b y} = \log_b x - \log_b y, \quad y \neq 1$ False $\log_b x - \log_b y = \log_b\left(\frac{x}{y}\right)$

(b) $\log_b \dfrac{x}{y} = \dfrac{\log_b x}{\log_b y}, \quad y \neq 1$ False

(c) $\log_b(x+y) = \log_b x + \log_b y$ False $\log_b x + \log_b y = \log_b(xy)$

(d) $\log_b \sqrt{x} = \dfrac{\ln x}{2 \ln b}$ T $\log_b \sqrt{x} = \frac{1}{2}\log_b x = \frac{1}{2}\frac{\ln x}{\ln b}$

(e) $\log_b x \cdot \log_b y = \log_b x + \log_b y$ False

11. If $y = 2\cot 2x$, then the number of vertical asymptotes over the interval $\left(-\frac{\pi}{4}, \frac{3\pi}{4}\right)$ is equal to

(a) 2

(b) 1

(c) 3

(d) 4

(e) 0

$2x = n\pi$

$x = n\frac{\pi}{2}$

$-\frac{\pi}{4} < n\frac{\pi}{2} < \frac{3\pi}{4}$

$-\frac{1}{2} < n < \frac{3}{2}$ $\times \frac{2}{\pi}$

$n = 0, 1$

$x = 0$ , $x = \frac{\pi}{2}$

12. The reference angle $\theta'$, in radians, of the angle $\theta = -1656°$ is equal to

(a) $\frac{\pi}{6}$

(b) $\frac{\pi}{3}$

(c) $\frac{\pi}{9}$

(d) $\frac{\pi}{5}$

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

$\theta = -1656°$ is coterminal w/

$-1656° + 5(360°)$

$-1656° + 1800° = 144° \in QII$

$\Rightarrow$ ref ang $= 180° - 144° = 36°$

$\theta = 36° \cdot \frac{\pi}{180} = \cancel{36°} \cdot \frac{2\pi}{\cancel{360°}_{10}} = \boxed{\frac{\pi}{5}}$

15. The expression $\dfrac{\tan t}{1+\sec t}+\dfrac{1+\sec t}{\tan t}$ simplifies to

(a) $2\tan t$

(b) $2\sec t$

(c) $2\cot t$

(d) $2\csc t$

(e) $2\sin t$

$$\frac{\tan t(\sec t-1)}{(\sec t+1)(\sec t-1)}+\frac{1+\sec t}{\tan t}$$

$$\frac{\tan t(\sec t-1)}{\tan^2 t}+\frac{(1+\sec t)}{\tan^2 t}$$

$$=\frac{2\sec t}{\tan t}=2\cdot\frac{1}{\cos}$$

16. If a wheel of radius 8 centimeters is rotating at 450 revolutions per minute, then the **linear speed** of a point on the edge of the wheel in centimeters per seconds is equal to

(a) $220\pi$

(b) $120\pi$

(c) $240\pi$

(d) $230\pi$

(e) $110\pi$

$r$ $\omega$ $v$

$v=\omega\cdot r$ rad/t

$=\frac{450\cdot 2\pi\cdot 8}{15}$ cm/min

$=\frac{450\cdot 2\pi\cdot 8}{60}$ cm/s

$=15\cdot 8\pi$ cm/s

$=120\pi$ cm/s

19. The exact value of the expression

$$2\cos\left(-\frac{7\pi}{4}\right)\tan(240°) - \sqrt{6}\csc\left(\frac{7\pi}{6}\right)$$

is

$2\cos\left(\frac{7\pi}{4}\right)\tan(240°) - \sqrt{6}\cdot\csc\left(\frac{7\pi}{6}\right)$

IV → C, cos +; III, +; III, −

(a) $\sqrt{6}$

(b) $-2\sqrt{6}$

(c) $2\sqrt{6}$

(d) $-\sqrt{6}$

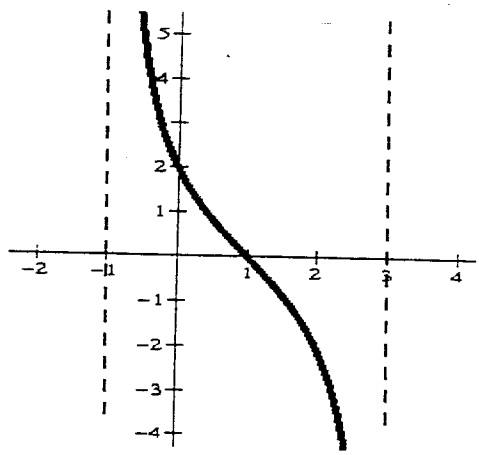
(e) $3\sqrt{6}$

$2\cos\frac{\pi}{4}\left(+\tan 60°\right) - \sqrt{6}\left(\csc\frac{\pi}{6}\right)$

$2\cdot\frac{\sqrt{2}}{2}\cdot\sqrt{3} + \sqrt{6}\cdot 2 = \sqrt{6} + 2\sqrt{6}$

$= \boxed{3\sqrt{6}}$

20. If the given graph represents the function $y = a\tan(bx+c)$ over the interval $(-1, 3)$, then the values of $a$, $b$ and $c$ are given by




(a) $a = -2,\ b = \frac{3\pi}{4},$ and $c = -\frac{\pi}{4}$

(b) $a = -2,\ b = 4\pi,$ and $c = -4\pi$

(c) $a = 2,\ b = -\frac{\pi}{4},$ and $c = -\frac{\pi}{4}$

(d) $a = -2,\ b = \frac{\pi}{4},$ and $c = -\frac{\pi}{4}$

(e) $a = 2,\ b = \frac{\pi}{4},$ and $c = \frac{\pi}{4}$

⇒ VA = $x = -1$, $x = 3$

x-int $x = 1$

PS = 1

P = $3 - (-1) = 4 = \frac{\pi}{b}$

⇒ $b = \frac{\pi}{4}$

The graph is decreasing ⇒ $a < 0$

23. Which one of the following is an **odd** function?

(a) $f(x) = x^3 + \tan^2 x$

(b) $f(x) = \dfrac{1 + x\cos x}{\sin x + \tan x}$

(c) $f(x) = \dfrac{3\cos x}{x^2 \tan x + \csc x}$

(d) $f(x) = x^3 \csc x + 1$

(e) $f(x) = \dfrac{x^2}{3 + \cos x}$

24. If, in the given figure, the length of $AC$ is 10 cm, then the length of $BD$ is

(a) $\dfrac{20}{1+\sqrt{3}}$ cm

(b) $\dfrac{10}{\sqrt{3}-1}$ cm

(c) $\dfrac{10}{1+\sqrt{3}}$ cm

(d) $\dfrac{10\sqrt{3}}{\sqrt{3}-1}$ cm

(e) $\dfrac{10\sqrt{3}}{1+\sqrt{3}}$ cm