1. If $\sec x - \tan x = A$ where $A \neq 0$, then $\sec x + \tan x =$

$$\sec x + \tan x = \frac{(\sec x + \tan x)(\sec x - \tan x)}{(\sec x - \tan x)}$$

$$= \frac{\sec^2 x - \tan^2 x}{\sec x - \tan x} = \frac{(\tan^2 x + 1) - \tan^2 x}{A}$$

$$= \frac{1}{A}$$

(a) 0

(b) A^2

(c) $-A$

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

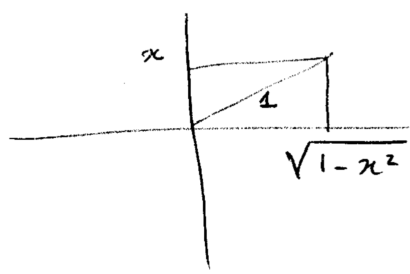
(e) $\frac{1}{A}$

$\text{II} \rightarrow \tan \ominus$ & $\theta' = 20^\circ$

2. If $\sin 20^\circ = x$, then $\tan 160^\circ = -\tan 20^\circ$

$$= \boxed{-\frac{x}{\sqrt{1-x^2}}}$$

$\sin 20^\circ = x$



(a) $\frac{\sqrt{1-x^2}}{x}$

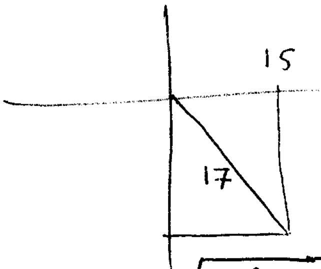
(b) $-\frac{\sqrt{1+x^2}}{x}$

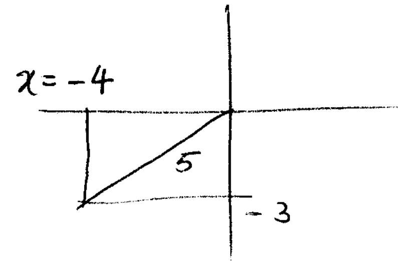
(c) $-\frac{x}{\sqrt{1-x^2}}$

(d) $\frac{x}{\sqrt{x^2-1}}$

(e) $\frac{x}{\sqrt{1+x^2}}$

5. If $\cos\alpha = \frac{15}{17}$, α in Quadrant IV, and $\sin\beta = -\frac{3}{5}$, β in Quadrant III, then $\tan(\alpha - \beta) =$





(a) $\frac{77}{84}$

(b) $-\frac{13}{84}$

(c) $-\frac{77}{36}$

(d) $\frac{84}{77}$

(e) $-\frac{49}{36}$

$y = -\sqrt{17^2 - 15^2} = -\sqrt{64} = -8$

$$\tan(\alpha - \beta) = \frac{\tan\alpha - \tan\beta}{1 + \tan\alpha\tan\beta} = \frac{-\frac{8}{15} - \left(\frac{3}{4}\right)}{1 + \left(-\frac{8}{15}\right)\left(\frac{3}{4}\right)}$$

6. $$\frac{\frac{1}{\sin x} + \csc x}{\frac{1}{\sin x} - \sin x} = \frac{\frac{1}{\sin x} + \frac{1}{\sin x}}{\frac{1}{\sin x} - \frac{\sin^2 x}{\sin x}} = \frac{\frac{2}{\sin x}}{\frac{1 - \sin^2 x}{\sin x}} = \frac{2}{\cancel{\sin x}} \cdot \frac{\cancel{\sin x}}{1 - \sin^2 x}$$

$$= \frac{2}{1 - \sin^2 x} = \frac{2}{\cos^2 x} = 2\sec^2 x$$

(a) $2\tan^2 x$

~~(b)~~ $2\sec^2 x$

(c) $2\cos^2 x$

(d) $2\csc^2 x$

(e) $2\sin^2 x$

9. $\log_4 16 + \log_{\frac{3}{2}} \dfrac{8}{27} + \left(\dfrac{1}{2}\right)^{\log_2 3} =$

(a) $\dfrac{1}{3}$

(b) $\dfrac{4}{3}$

(c) $-\dfrac{2}{3}$

(d) $-\dfrac{4}{3}$

(e) $\dfrac{2}{3}$

$\log_4 4^2 + \log_{3/2}\left(\dfrac{2}{3}\right)^3 + \dfrac{1}{(2)^{\log_2 3}}$

$2 + \log_{3/2}\left(\dfrac{3}{2}\right)^{-3} + \dfrac{1}{3}$

$2 - 3 + 1/3$

$-1 + 1/3 = \boxed{-2/3}$

10. If $0 \le x \le \dfrac{2\pi}{3}$, then the graph of $y = |-2\cos 3x|$ is increasing on the interval

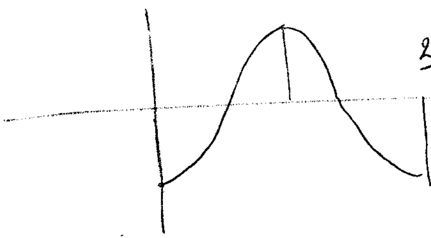
(a) $\left[\dfrac{\pi}{6}, \dfrac{\pi}{2}\right]$

(b) $\left[\dfrac{\pi}{6}, \dfrac{\pi}{3}\right] \cup \left[\dfrac{\pi}{2}, \dfrac{2\pi}{3}\right]$

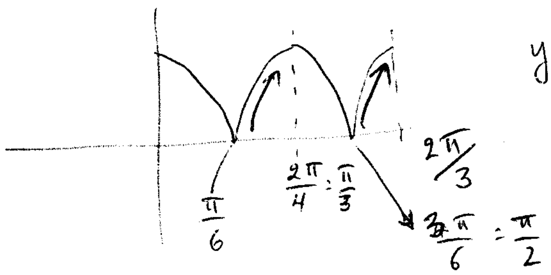
(c) $\left[0, \dfrac{\pi}{6}\right] \cup \left[\dfrac{\pi}{3}, \dfrac{\pi}{2}\right]$

(d) $\left[0, \dfrac{\pi}{6}\right] \cup \left[\dfrac{\pi}{2}, \dfrac{2\pi}{3}\right]$

(e) $\left[0, \dfrac{\pi}{3}\right]$



$y = -2\cos 3x$

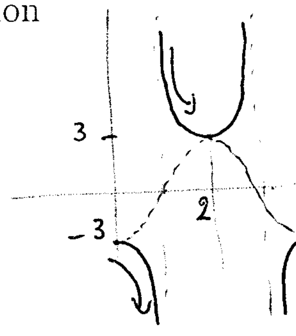


$y = |-2\cos 3x|$

The function is increasing on $\left[\frac{\pi}{6}, \frac{\pi}{3}\right] \cup \left[\frac{\pi}{2}, \frac{2\pi}{3}\right]$

13. Which one of the following statements is TRUE about the function $f(x) = -3\sec\frac{\pi x}{2}$ on the interval $[0,2]$? [Hint: sketch]

$P = \frac{2\pi}{\left(\frac{\pi}{2}\right)} = 2\pi \cdot \frac{2}{\pi} = 4$



(a) the maximum value of f is 3 False

(b) f is decreasing on $[0,1) \cup (1,2]$ True

(c) f is decreasing on $[0,1)$ and increasing on $(1,2]$ False

(d) the minimum value of f is -3 No

(e) there are two vertical asymptotes for the graph of f No only one $\boxed{x = 1}$

14. Which one of the following is a factor of $\csc^2 x + \cot x - 31$?

$= \cot^2 x + 1 + \cot x - 31$

$= \cot^2 x + \cot x - 30$

$= (\cot x + 6)(\cot x - 5)$

(a) $\cot x - 15$

(b) $\csc x - 5$

(c) $\csc x - \cot x$

(d) $\boxed{\cot x + 6}$

(e) $\cot x + 2$

17. If P is the period and S is the phase shift of the function $y = 3\csc\left(\frac{\pi}{2} - \frac{x}{4}\right)$, then $P+S$ is equal to

(a) 3π

(b) 10π

(c) $\frac{17\pi}{2}$

(d) -6π

(e) $\frac{\pi}{8}$

$$y = 3\csc\left(\frac{\pi}{2} - \frac{x}{4}\right)$$

$$= -3\csc\left(\frac{x}{4} - \frac{\pi}{2}\right)$$

$$b = \frac{1}{4} \qquad c = -\frac{\pi}{2}$$

$$P = \frac{2\pi}{\left(\frac{1}{4}\right)} = 8\pi \qquad PS = -\frac{c}{b} = -\frac{-\frac{\pi}{2}}{\frac{1}{4}}$$

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

$$P + S = 8\pi + 2\pi$$

$$= \boxed{10\pi}$$

18. The length of an arc that subtends a central angle of 135° in a circle of radius 40 ft is

(a) 25π feet

(b) 15π feet

(c) 35π feet

(d) 20π feet

(e) 30π feet

in radian

$$S = \theta . r$$

$$= \left(135° . \frac{\pi}{180}\right) . 40$$

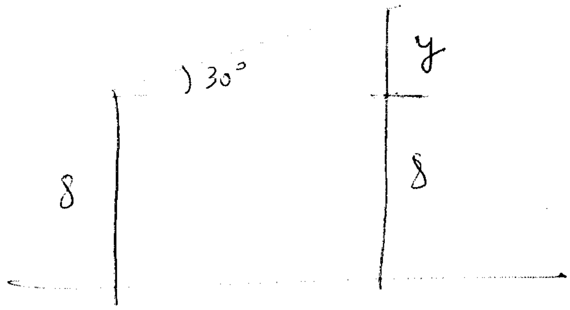
$$= \frac{3^3 . \cancel{5}\,\pi}{\cancel{2^2} . \cancel{3^2} . \cancel{5}} . \cancel{40}\,10$$

$$= \boxed{30\pi \quad cm}$$

135	3
45	3
15	3
5	5
1	

180	2
90	2
45	3
15	3
5	5
1	

21. Two buildings are 240 meters 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 8 meters high, then the taller building is



(a) $(8 + 8\sqrt{3})$ meters high

(b) $(8 + 80\sqrt{2})$ meters high

(c) $(8 + 8\sqrt{2})$ meters high

(d) 88 meters high

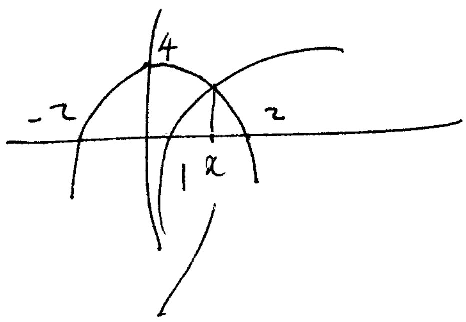
(e) $(8 + 80\sqrt{3})$ meters high

$8 + y = 8 + 240 \tan 30°$

$= 8 + \cancel{240}^{80} \cdot \frac{\sqrt{3}}{\cancel{3}}$

$= \boxed{8 + 80\sqrt{3}}$ m.

22. If x is the solution of the equation $\ln x = 4 - x^2$, then x is in the interval [Hint: Use the graphs of $f(x) = \ln x$ and $g(x) = 4 - x^2$]



(a) $[1, 2]$

(b) $[0, 1]$

(c) $[2, 4]$

(d) $\left[\frac{1}{\sqrt{2}}, \frac{1}{2}\right]$

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

x in $[1, 2]$

25. Let W be the wrapping function with $W(t) = \left(\frac{3}{5}, -\frac{4}{5}\right)$,

then $\sin\left(\frac{3\pi}{2} - t\right) + \tan(7\pi + t) =$

$\cos t$ $\sin t$

(a) $\frac{11}{15}$

(b) $-\frac{29}{15}$

(c) $-\frac{8}{15}$

(d) $\frac{29}{15}$

(e) $-\frac{11}{15}$

$\sin\left(\frac{3\pi}{2} - t\right) = +\sin\left(\frac{\pi}{2} + \pi - t\right) = \cos(t + \pi)$
$= -\cos t = -3/5$

or $\sin\left(\frac{3\pi}{2} - t\right) = \sin\frac{3\pi}{2}\cos t - \cos\frac{3\pi}{2}\sin t$
$= (-1)\cos t - 0 \sin t$
$= -3/5$

$\tan(7\pi + t) = \tan t = \frac{\sin t}{\cos t} = \boxed{\frac{-4}{3}}$

π is period of tan

$-3/5 - 4/3 = -\left(\frac{9 + 20}{15}\right) = \boxed{-\frac{29}{15}}$