

PreCalc '13-14  
Chapter 9 Test

Name SOLUTION KEY

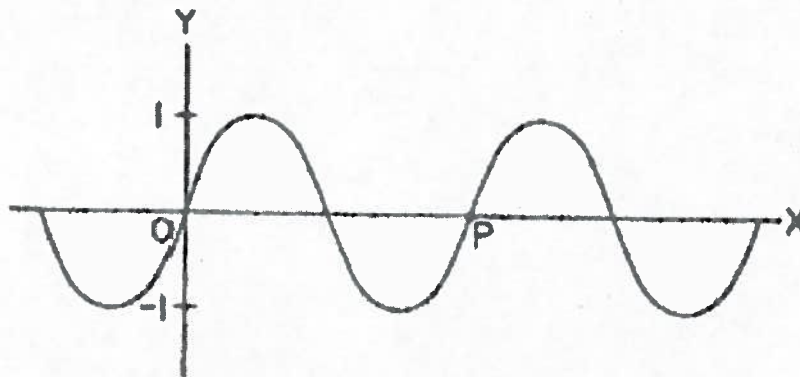
Score \_\_\_\_\_

1. On the graph of  $y = \cot x$ , as  $x$  increases on  $x \in \left[-\frac{1}{4}, \frac{1}{4}\right]$ , the function  $y$

- (a) decreases      (b) is constant      (c) increases  
(d) decreases, then increases      (e) increases, then decreases



2. This is the graph of  $y = \sin \frac{2\pi}{3}x$ .



What is the  $x$ -value of  $P$ ?

$P_{2\pi} = \frac{2\pi}{2\pi/3} = 3$

- A.  $\frac{1}{3}$     B.  $\frac{2}{3}$     C. 2    **D. 3**    E. 6

3. Given  $g(x) = 3 + 2\sin\left[\frac{\pi}{4}(x+1)\right]$ , which of the following statements is true?

- ~~I.~~ The amplitude of  $g(x)$  is 3.  
**II.** The period of  $g(x)$  is 8.  
~~III.~~ The phase shift is 1.

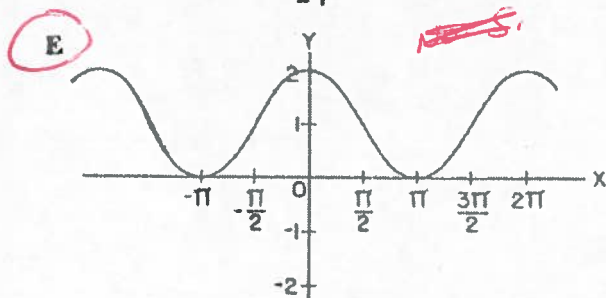
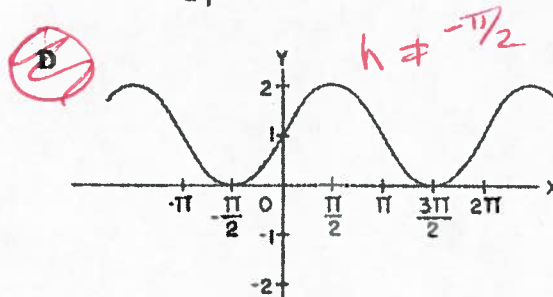
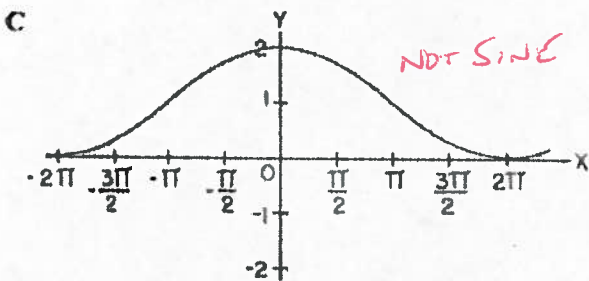
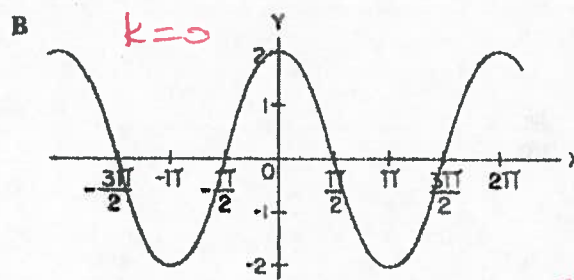
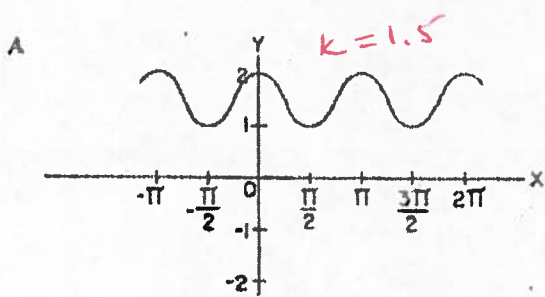
- (a) I only      **(b) II only**      (c) I and II only  
(d) II and III only      (e) I, II and III

4. What is the smallest positive value where  $y = 3 - 2 \cot \left[ \frac{\pi}{8}(x-1) \right]$  has a vertical asymptote?

$h = 1$

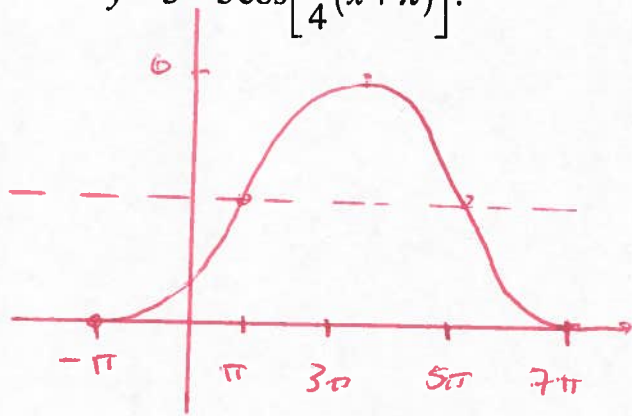
- (a) 1 (b) 5 (c) 9 (d) 13 (e) 17

5. Which of the following is the graph of  $y = 1 + \sin \left( x + \frac{\pi}{2} \right)$ ?



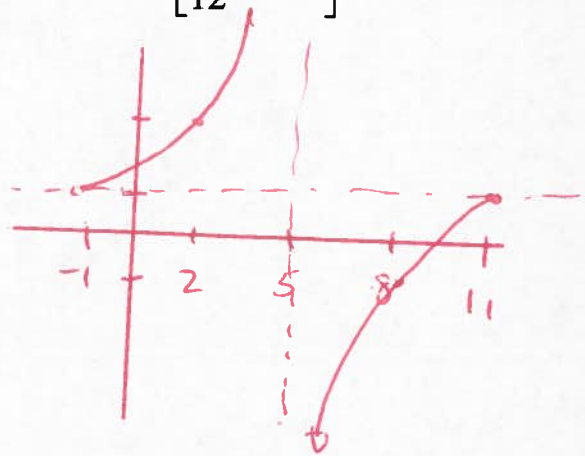
6. Sketch the primary cycle of

$$y = 3 - 3\cos\left[\frac{1}{4}(x + \pi)\right].$$

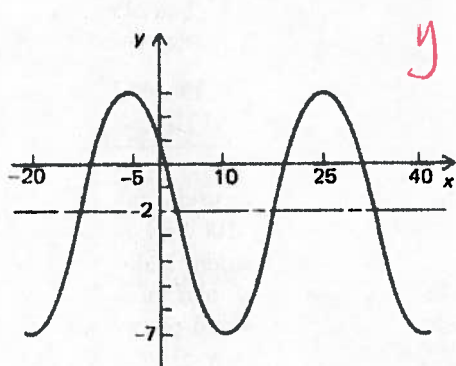


7. Sketch one cycle of

$$y = 2 + \tan\left[\frac{\pi}{12}(x + 1)\right].$$

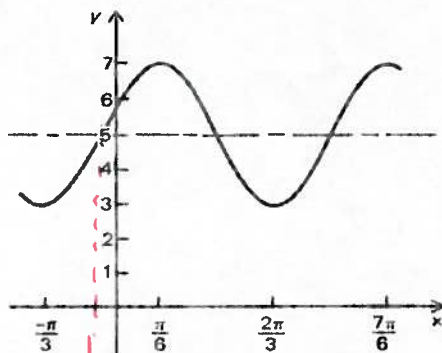


8. Find a cosine equation for this graph:



$$y = -2 + 5\cos\frac{\pi}{15}(x + \frac{\pi}{5})$$

9. Find a sine equation for this graph:



$$y = 5 + 2\sin\left[2\left(x + \frac{\pi}{2}\right)\right]$$

$$h = -\frac{\pi}{12}$$

10. If  $H(x) = 3 + 4 \cos\left[\frac{\pi}{6}(x-11)\right]$ , find the first three negative values of  $x$  where

$$H(x) = 0. = 3 + 4 \cos \frac{\pi}{6} (x-11)$$

$$-3/4 = \cos \frac{\pi}{6} (x-11)$$

$$\pm 2.419 = \frac{\pi}{6} (x-11)$$

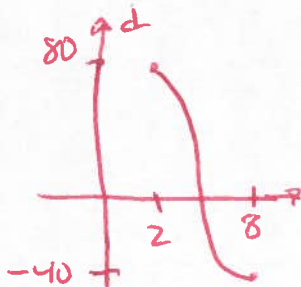
$$\pm 4.620 \pm 12n = x-11$$

$$\left. \begin{array}{l} 15.620 \pm 12n \\ 6.380 \pm 12n \end{array} \right\} = x$$

$$x = \{-5.620, -8.380, -17.620\}$$

11. At a certain point on a beach, a 76 cm tall post sticks out of the sand. The depth of the water on the post varies sinusoidally with time due to tides. It is high tide at 2am and the water is 4 cm over the top of the post. At 8 am, low tide is reached and the water is 120 cm lower than at high tide.

- Sketch one cycle of the situation.
- Find an equation that represents  $d$  in terms of  $t$ .
- Where is the water at 10:15 am?
- Between what two times is the post fully exposed? range when it is below 700 km, for how many minutes is the ship out of range?



$$b) d = 20 + 60 \cos\left[\frac{\pi}{6}(t-2)\right]$$

$$c) d(10.25) = -2.961$$

$$d) 0 = 20 + 60 \cos \frac{\pi}{6} (t-2)$$

$$-1/3 = \cos \frac{\pi}{6} (t-2)$$

$$\pm 1.911 \pm 2\pi n = \frac{\pi}{6} (t-2)$$

$$\pm 3.649 \pm 12n = t-2$$

$$t = \begin{cases} 5.649 \pm 12n \\ -1.649 \pm 12n \end{cases}$$

$$5:39 < t < 10:21$$