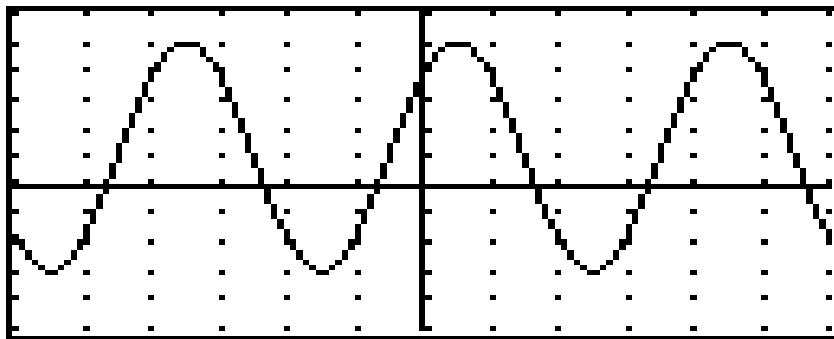
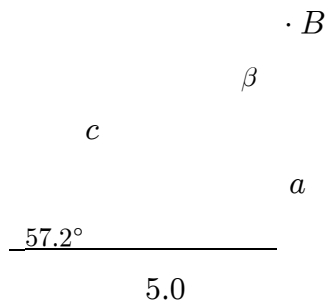


Please show your work on these pages. You may use calculators on this test, but answer with exact values unless an approximation is requested: for example  $\pi$  is exact, while 3.14 is not. You may use one 4"x 6" card of notes. Put your answers in the space provided--answers without supporting work may not receive full credit.

- Find the coordinates of the point  $P$  on the unit circle that corresponds to  $t$  and find the exact value of the six trigonometric functions of  $t = \frac{17\pi}{6}$ .
- Sketch one period the graph of the function  $y = 3 \cos\left(2x - \frac{\pi}{3}\right) + 2$ ; label the high and low points and all the points on the 'midline' with ordered pairs.
- Find a sine function and a cosine function that would produce the following graph :



- Given the indicated parts of the triangle  $ABC$ , find the exact values of the remaining values, and also an approximation for each length to the nearest tenth.

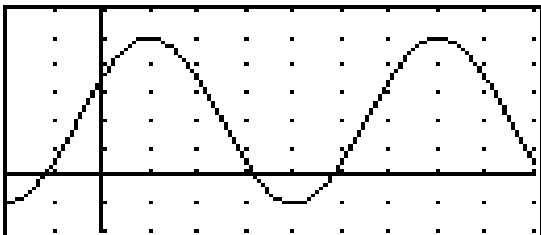


[connect the ends of the line segment with the point  $B$  to draw the triangle]

5. As a hot-air balloon rises vertically, its angle of elevation from a point  $P$  on level ground 110 kilometers from the point  $Q$  directly underneath the balloon changes from  $19.5^\circ$  to  $32.3^\circ$  (see the figure). Approximate (to the nearest tenth of a kilometer) how far the balloon rises during this period. [Use the figure from p. 489]
6. Find all values of  $x$  that satisfy the given equations:
- a.  $\sin\left(2x - \frac{\pi}{3}\right) = \frac{1}{2}$                       b.  $\tan^2 x - 3 = 0$
7. Verify the following identities (algebraically):
- a.  $\tan t + 2 \cos t \csc t = \sec t \csc t + \cot t$
- b.  $\frac{\csc x - 1}{\cot x - \cos x} = \sec x$
- c.  $\frac{1 + \cos \theta}{\sin \theta} + \frac{\sin \theta}{1 + \cos \theta} = 2 \csc \theta$
8. Find the solutions of the equation that are in the interval  $[0, 2\pi)$  :
- $\cos(2x) + \sin x = 0$

1.  $\sin t = \frac{1}{2}$   $\cos t = -\frac{\sqrt{3}}{2}$   $\tan t = -\frac{\sqrt{3}}{3}$   
 $\cot t = -\sqrt{3}$   $\sec t = -\frac{2\sqrt{3}}{3}$   $\csc t = 2$

2. Note that  $x$ -scale has marks every  $\frac{\pi}{6}$  units,  $y$ -scale has marks every 1 unit .



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

4.  $\beta = 32.8^\circ$   $c = \frac{5}{\cos(57.2^\circ)} \approx 9.2$   $a = 5 \tan(57.2^\circ) \approx 7.8$

5.  $110 \tan(32.3^\circ) - 110 \tan(19.5) \approx 30.6 \text{ km}$

6. a.  $2x - \frac{\pi}{3} = \frac{\pi}{6} + n(2\pi)$  or  $2x - \frac{\pi}{3} = \frac{5\pi}{6} + n(2\pi)$     so  $x = \frac{\pi}{4} + n(\pi)$  or  $x = \frac{7\pi}{12} + n(\pi)$

b.  $\tan x = \pm \sqrt{3}$      $x = \frac{\pi}{3} + n\pi$  or  $x = \frac{2\pi}{3} + n\pi$

7. identities

8.  $(1 - 2 \sin^2 x) + \sin x = 0$      $\sin x = 1$  or  $\sin x = -\frac{1}{2}$      $\left\{ \frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6} \right\}$