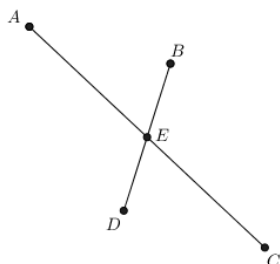Write your responses on the pages provided or attach additional pages, as needed. No notes are allowed. A scientific calculator is allowed, but not a graphing calculator.

Given:
$\overline{AC}$ and $\overline{BD}$ intersect at E which is the midpoint of both $\overline{AC}$ and $\overline{BD}$.

Prove:

$ABCD$ is a parallelogram

1.

Statement	Reason
1. _____	1. Definition of midpoint.
2. $\angle AEB \cong \angle DEC$ and $\angle AED \cong \angle BEC$	2. _____
3. Draw AB, BC, CD and DA.	3. _____
4. _____ and _____	4. SAS
5. $\angle DBC \cong \angle BDA$ and $\angle DBA \cong \angle BDC$	5. _____
6. $\overline{AB} \| \overline{DC}$ and $\overline{AD} \| \overline{BC}$	6. _____
7. $ABCD$ is a parallelogram	7. _____

2. Let $f(x) = \dfrac{\sqrt{x-1}}{x-3}$.

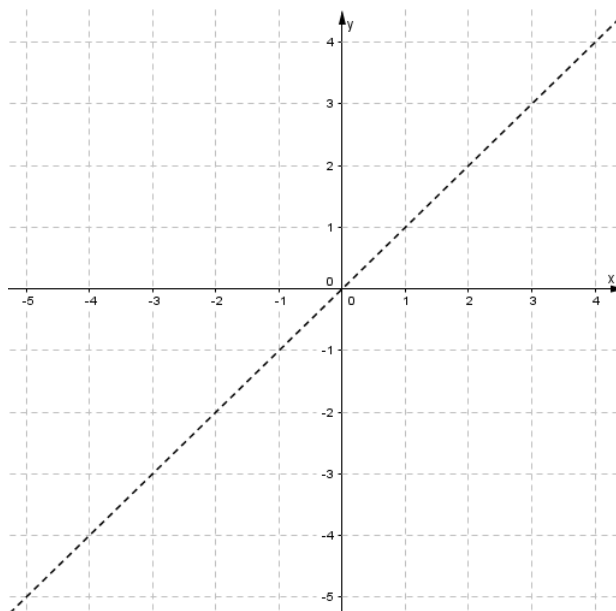   (a) Evaluate $f(1)$, $f(5)$ and $f(a^2+1)$

   (b) Find the domain of f.

   (c) What is the average rate of change of f between $x = 5$ and $x = 17$?

3. Let $f(x) = \sqrt{4 - x}$.

  (a) Find a formula for the inverse function, $f^{-1}(x)$.

  (b) Find the domain of f^{-1}. Recall that the range of f is the domain of f^{-1}.

  (c) Complete the table for $f^{-1}(x)$:

x	0	1	2	3
$f^{-1}(x)$				

  (d) Sketch graphs for $y = f(x)$ and $y = f^{-1}(x)$ together showing symmetry through the line $y = x$:

4. Find the exact value of each expression:

  (a) $\sin \dfrac{4\pi}{3}$

  (b) $\tan \dfrac{7\pi}{6}$

  (c) $\sec \dfrac{13\pi}{6}$
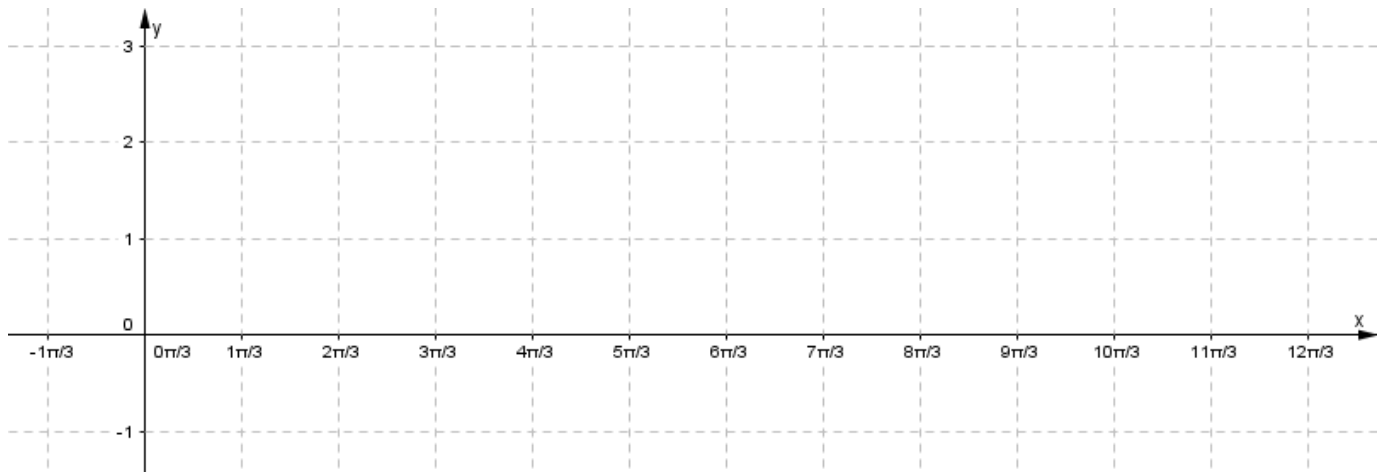
  (d) $\cos \dfrac{17\pi}{3}$

5. Let $f(x) = 1 + 2\sin\left(\frac{1}{2}x + \frac{\pi}{6}\right)$

(a) Complete the table:

x	$-\dfrac{\pi}{3}$	0	$\dfrac{\pi}{3}$	$\dfrac{2\pi}{3}$	π	$\dfrac{4\pi}{3}$	$\dfrac{5\pi}{3}$
$f(x)$							

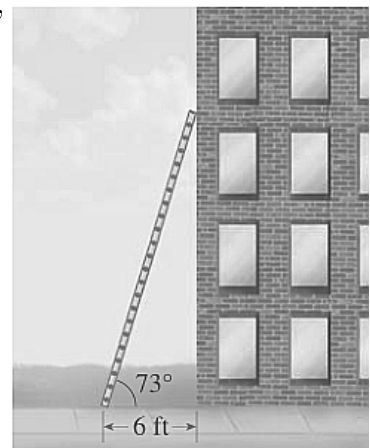(b) What are the amplitude, phaseshift, period and line of equilibrium for f ?

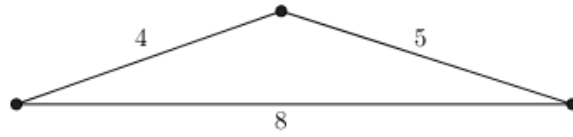(c) Sketch a graph showing one complete oscillation for f.

6. The base of the ladder in the figure is 6 ft from the building, and the angle formed by the ladder and the ground is 73°.

(a) How high up the building does the ladder touch?
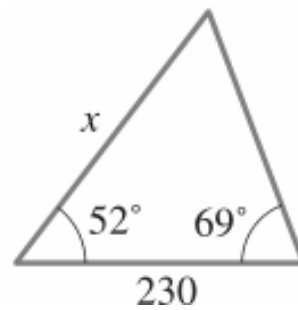
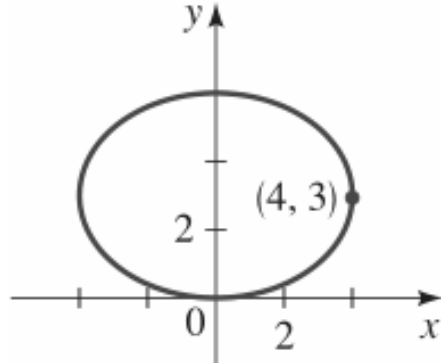(b) What is the length of the ladder?

7. Refer to the figure below.

(a) Find the angle opposite the longest side.

(b) Find the area of the triangle.

8. Find the side labeled x.

9. Consider the ellipse whose graph is shown.
   (a) What are the coordinates of the center?

   (b) Find an equation for the ellipse.

   (c) What are the coordinates of the foci?

10. Consider the hyperbola whose equation is $(x - 1)^2 - y^2 = 1$
    (a) Find the coordinates of center.

    (b) Find the x-intercepts of the hyperbola.

    (c) Find the coordinates of the two foci.

    (d) Find equations for the asymptotes of the hyperbola.

    (e) Sketch a graph for the hyperbola