-4. Find the equation of the following parabola.

-3. Find the equation of the following parabola.
-2. Consider the function
\[ y = x^2 + 12x + 23. \]
   a. Convert the equation to vertex-normal form.

   b. What is the vertex?

   c. What is the axis of symmetry?

-1. Find the maximal value of the function
\[ y = -2x^2 - 12x - 16. \]
0. Find the minimal value of the function
\[ y = 3x^2 - 24x + 46. \]

1. Draw and label the side lengths and angles of a 30°-60°-90° triangle and a 45°-45°-90° triangle.
2. Find the exact value of
   a. \( \sin(-\pi/3) \).

   b. \( \cos(-390^\circ) \).

   c. \( \sec(3\pi/4) \). Note that \( \sec(x) = 1/\cos(x) \).

   d. \( \cot(840^\circ) \). Note that \( \cot(x) = 1/\tan(x) = \cos(x)/\sin(x) \).

   e. \( \csc(-7\pi/4) \). Note that \( \csc(x) = 1/\sin(x) \).

   f. \( \cot(121\pi/3) \).

   g. \( \sec(-3810^\circ) \).
3. Find the angle $b$ in degrees, the length of $C$ and the area of the big triangle.
4. Solve the trigonometric equation (find all solutions).

2 \cos(x) + 2 = 3

5. Use the identity \( \cos^2(x) + \sin^2(x) = 1 \) to find the solutions in the interval \([0, 2\pi]\) for the trigonometric equation

\[-5 \cos^2(x) + 9 \sin(x) = -3.\]
6. Find the angles $B$ and $C$, the coordinates of $(a, b)$, and the area of the triangle.
7. Find the area of the figure.
8. Find the lengths of $A$, $B$ and $C$, and the area of the big triangle.
9. An airplane is flying at 170 km/s towards the north-east, in a direction making an angle of 52° with the eastward direction.

The wind is blowing at 30 km/s towards the north west, making an angle 20° with the northward direction. What is the actual “ground speed” of the airplane, and what is the angle A between the airplane’s actual path and the eastward direction?
10. The angle of elevation of a hot air balloon, climbing vertically, changes from 25 degrees at 10:00 am to 60 degrees at 10:02 am. The point of observation of the angle of elevation is situated 300 meters away from the take off point. What is the upward speed, assumed constant, of the balloon? Give the answer in meters per second and round to two decimal places.
11. Find $A$, $B$, $h$ and $k$ so that function $f$ defined by

$$f(x) = A\sin(B(x - h)) + k$$

has the following properties: the maximum value of $f(x)$ is 7 and $f(0) = 7$, the minimum value of $f(x)$ is 3, the period of the graph of function $f$ is equal to $2\pi/3$.

12. In a certain city, the number of daylight hours $H(t)$ at a time $t$ of the year is given
by

$$H(t) = A\sin[(2\pi/365)t + c] + D$$

where $t = 0$ corresponds to January 1st. The maximum number of daylight hours
occurs on June 21st (or 171 days after January 1st) and is equal to 15 hours. The
minimum number of daylight hours is equal to 11 hours. Find $A$, $c$ and $D$. 
13. A bicycle traveled a distance of 100 meters. The diameter of the wheel of this bicycle is 40 cm. Find the number of rotations of the wheel.

14. The wheel of a car made 100 rotations. What distance has the car traveled if the diameter of the wheel is 60 cm?
15. The wheel of a machine rotates at the rate of 300 rpm (rotation per minute). If the diameter of the wheel is 80 cm, what are the angular (in radian per second) and linear speed (in cm per second) of a point on the wheel?

16. The Earth rotates about its axis once every 24 hours (approximately). The radius $R$ of the equator is approximately 4000 miles. Find the angular (radians / second) and linear (feet / second) speed of a point on the equator.