

1. Transform the functions below into factored form.

a)  $f(x) = x^2 - 8x + 15$

b)  $f(x) = -0.5x^2 + 3x + 20$

c)  $f(x) = -x^2 + 10x - 25$

2. Transform the functions below into standard form.

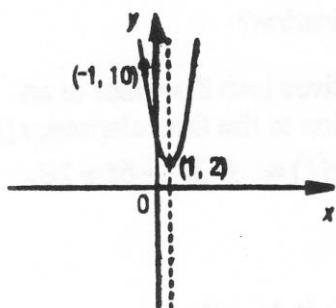
a)  $f(x) = 3x^2 - 9x - 54$

b)  $f(x) = x^2 - 16$

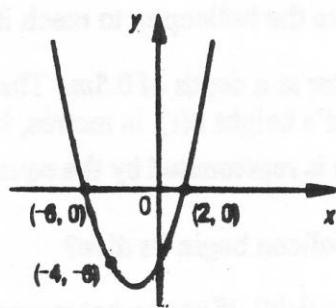
c)  $f(x) = -2x^2 - 32x - 128$

3. Determine the rule for each quadratic function presented in the graphs below.

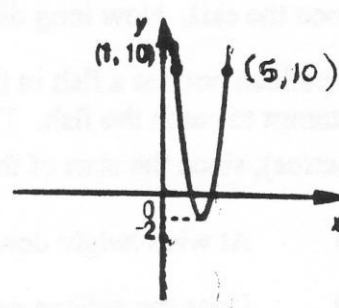
a)



b)



c)



4. A quarterback standing 10m from the centre of the field in the offensive zone throws the ball toward the goal line. The ball reaches a maximum height of 26m at a distance of 30m from the centre of the field. Using the centre of the field as the origin, and knowing that the ball was released at a height of 2m from the ground,

- determine the equation of the ball's trajectory.
- determine where a receiver should be if he wants to catch the ball at a height of 1.2m.
- determine if a player standing 50m from the quarterback would be able to catch the ball.

5. A cannon ball, targeting a boat, is launched from the top a cliff. 4.8 seconds after being shot, the cannon ball reaches a height of 72m relative to the surface of the water. The cannon ball follows a parabolic trajectory and falls into the water just beside the boat 1.2 seconds later. Considering that the cannon ball reached its maximum height 2.4 seconds after being shot, determine

- the height at which the cannon ball was shot.
- the maximum height reached by the ball.

6. The profits of a home construction company can be described by the equation

$P(x) = -1.4x^2 + 67.2x - 352.8$ , where  $P(x)$  represents the profit (in thousands of dollars) and  $x$  represents the number of homes constructed.

- How many homes must this company build in order to reach a maximum profit? What is this profit?
- How many homes must the company build in order to make a profit?

7. An object is thrown from a building at a height of  $10\text{m}$ . The parabolic trajectory can be represented by the equation  $y = -0.1x^2 + 1.5x + 10$ , where  $y$  represents the height of the object (in metres) and  $x$  its distance from the building. At what distance from the building does the object
- touch the ground?
  - reach its maximum height?
8. An emergency helicopter responds to a distress call. The altitude of the helicopter (in metres) can be represented by the function  $A(t) = -t^2 + 50t - 525$ , where  $t$  is the elapsed time (in minutes) since the call. How long did it take the helicopter to reach its destination?
9. A pelican notices a fish in the water at a depth of  $0.5\text{m}$ . The bird dives into the water in an attempt to catch the fish. The bird's height  $h(t)$ , in metres, in relation to the time elapsed,  $t$  (in metres), since the start of the dive is represented by the equation  $h(t) = -0.3t^2 - 6t + 28$ .
- At what height does the pelican begin its dive?
  - Does the pelican catch the fish? If so at what moment does it do so?
  - At what moment does the pelican resurface?