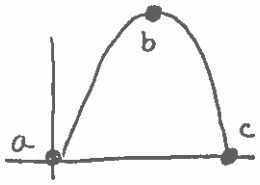
MPM 2D1

# Quadratic Relations

1. The path of a soccer ball is given by $y = -4x^2 + 10x$, where x is the time the since the ball is kicked, and y is the height of the ball above the ground in metres.
   a) Graph the function using technology. ✯ Use DESMOS ✯




- In quadratics there are 4 important points to any curve:
  1) The x-intercepts (zeros): where the curve crosses the x-axis. It can often occur twice.
  2) The vertex: where the curve changes direction. It is the highest or lowest point reached.
  3) The y-intercept: where the curve crosses the y-axis.

   b) Find these values and explain what their coordinates tell you in terms of the problem.
   c) Does the ball ever reach a height of 6 m?
   d) How long is the ball above 2 m for?

b) a (0,0) - the ball is at a height of zero when it starts
b (1.25, 6.25) - after 1.25 sec, the ball is at a height of 6.25 m
c (2.5, 0) - the ball lands after 2.5 sec

c) Yes, since it reaches a height of 6.25 m

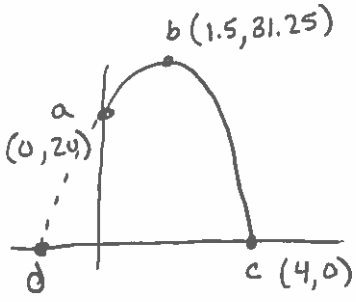
d) *Enter y=2 as a and equation to touch to find POIs

POI #1 (0.219, 2)

POI #2 (2.28, 2)

Above 2m from 0.219 sec to 2.28 sec or for 2.0161 sec

2. Alex is tossing pine cones from the side of a quarry. The pine cones fall into the water-filled hole below. The height, h, in meters, of the pine cone above the surface of the water is approximately given by $h = -5t^2 + 15t + 20$, where t is the time in seconds since Alex tossed the pine cone.
   a) Graph the function using technology, then sketch it below.
   b) Find the important points and label them on your graph. Explain what the coordinates tell you in terms of the problem.
   c) Why do you think that the left most t-intercept is not considered important?




b) - Alex is at a height of 20 m (Point A)
- The pine cones reach a height of 31.25 m after 1.5 sec (Point B)
- The pine cone lands in the water after 4 sec (Point C)

c) Point D (-1, 0) is not important because you can't have negative time!

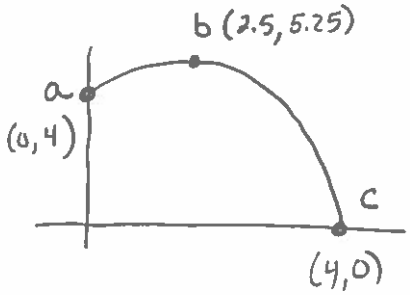
3. Amy dives off a springboard. Her height above the surface of the water, y, in meters, is related to her horizontal distance from the end of the board, x, in meters, by the function $y = -x^2 + 3x + 4$.

a) Graph the function using technology, then sketch it below. Label the important points.

b) How far from the board does Amy land?

c) What is the maximum height that Amy reaches? How far from the board is she at this point?

d) When Amy first steps onto the board, how high above the water is she?




b) Point C - Amy lands 4m from the board

c) Point B - Amy reaches a height of 5.25m when she is 2.5m from the end of the board

d) Point A - she is 4m above the water

Homework: Pg. 147 #'s: 12-14