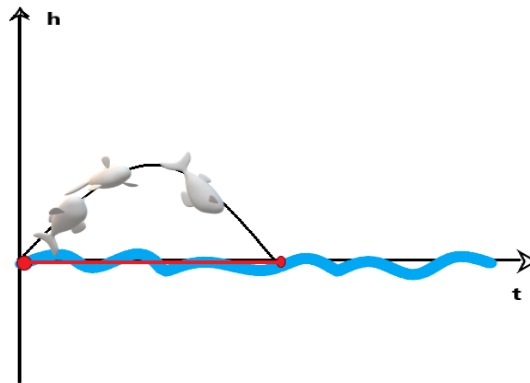


Exercises

Task 5.14 Solve the quadratic equations and inequalities:

- a) $9x^2 + 42x + 49 = 0.$
- b) $12x^2 - 25x + 12 = 0.$
- c) $x^2 + 4x + 1 = 0.$
- d) $x^4 - 3x^2 + 2 = 0$ Hint: Substitute $x^2 = t, t > 0.$
- e) $9 - x^2 \leq 0.$
- f) $x^2 - 8x > 0.$
- g) $-x^2 + 4x - 3 < 0.$
- h) $-x^2 + x - \sqrt{2007} < 0.$
- i) $x^2 + \sqrt{1999}x + 500 < 0.$
- j) $x(x + 1) \leq 0.$

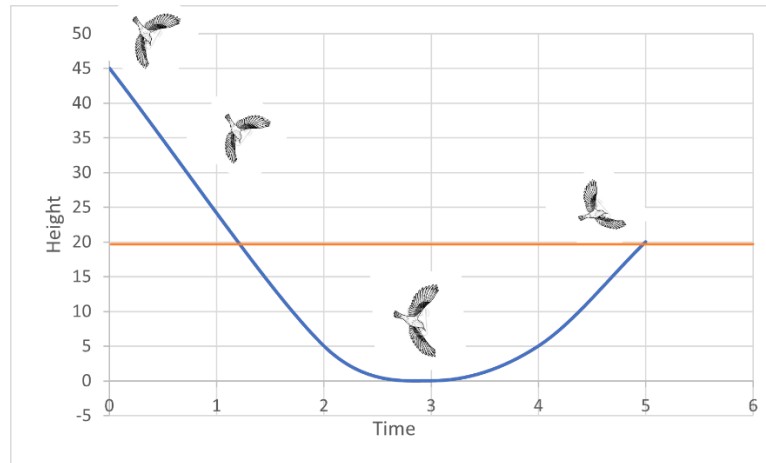
Task 5.15 A dolphin jumps out of the sea with an initial velocity of 20 feet per second (assume its starting height is 0 feet). Use the vertical motion model, $h = -16t^2 + vt + s$, where v is initial velocity in feet/second and s is the dolphin starting height in feet, to calculate the amount of time the dolphin is in the air before it hits the water again (see the Figure below). Round your answer to the nearest tenth if necessary.



Task 5.16 An osprey, a fish-eating bird of prey, dives toward the water to a salmon.



The height h , in meters of the osprey above the water t seconds after it begins its dive can be approximated by the function $h(t) = 5t^2 - 30t + 45$. Determine the time it takes for the osprey to reach a return height of 20 m. See figure below.



Task 5.17 A rocket is launched at $t = 0$ seconds. Its height, in meters above sea-level, is given the equation $h = -4.9t^2 + 52t + 376$. At what time does the rocket hit the sea? (Round answer to 2 decimal places).

Answers

5.14.

- a. $x = -\frac{7}{3}$
- b. $x_1 = \frac{3}{4}, x_2 = \frac{4}{3}$
- c. $x_1 = -2 - \sqrt{3}, x_2 = -2 + \sqrt{3}$
- d. $x_1 = 1, x_2 = -1, x_3 = \sqrt{2}, x_4 = -\sqrt{2}$
- e. $x \in (-\infty, -3] \cup [3, \infty)$
- f. $x \in (-\infty, 0) \cup (8, \infty)$
- g. $x \in (-\infty, 1) \cup (3, \infty)$
- h. $x \in \mathbb{R}$
- i. No solutions
- j. $x \in [-1, 0]$.

5.15. The dolphin is in the air for $\frac{5}{4} = 1.25 \approx 1.3$ seconds.

5.16. It takes 5 seconds for the osprey to reach a return height of 20 m.

5.17. $t = 15,55$ seconds.



Sample chapter exam

1. Sketch the following polynomials:

a) $f(x) = (x - 3)(x + 6)$

b) $f(x) = x^2 + 4x + 1.$

2. Find the y – and x –intercepts of a parabola $f(x) = 2x^2 - 3x - 2.$

3. Find the domain and range of $f(x) = 3x^2 + 9x - 1.$

4. Find the vertex of a quadratic function $f(x) = x^2 - x - 2.$ Rewrite the quadratic in standard form (vertex form).

5. Solve the equations:

a) $x^2 - 2x - 15 = 0.$

b) $x^2 + 4x + 15 = 0.$

6. Solve the inequalities:

a) $x^2 - x < 2$

b) $x^2 + 1 \geq 2x^2 - x.$

7. The seaman launch the flare from a crow's nest of a height of 5 meters. The height (h , in meters) of the flare t seconds after taking off is given by the formula:

$$h = -3t^2 + 14t + 5.$$

a) How long will it take for the flare to hit the sea?

b) Find the time when the flare is 5 meters from hitting the sea.

