

1.

In football, when a field goal attempt is kicked, it leaves the ground on a path for which the height of the ball h in feet at any time t seconds later might be given by a function like $h = 45t - 16t^2$.

a. Write and solve an equation that tells time(s) when the ball hits the ground at the end of its flight.

$$0 = 45t - 16t^2$$

$$0 = t(45 - 16t)$$

$$t = 0 \quad 45 - 16t = 0$$

$$-16t = -45$$

$$t = 2.8125$$

2.8125 sec

b. Write and solve an equation that tells time(s) when the ball is at the height of the end zone crossbar (10 feet above the ground).

$$10 = 45t - 16t^2$$

$$0 = -16t^2 + 45t - 10$$

$$a = -16$$

$$b = 45$$

$$c = -10$$

$$\frac{-45}{2(-16)} = \frac{-45}{-32} = 1.40625$$

$$45^2 - 4(-16)(-10) = 1385$$

$$x = 1.40625 + \frac{\sqrt{1385}}{-32} = .24$$

$$x = 1.40625 - \frac{\sqrt{1385}}{-32} = 2.569$$

$$2.57$$

At .24 and 2.57 sec

c. Find the maximum height of the kick and when it occurs.

Algebraically:

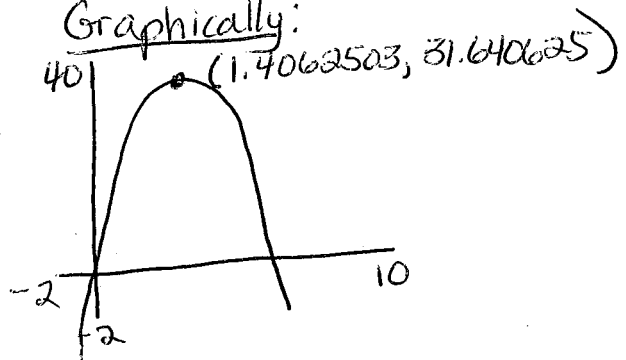
$$\frac{0 + 2.8125}{2} = 1.40625$$

$$45(1.40625) - 16(1.40625)^2$$

$$31.640625$$

$(1.40625, 31.640625)$
 \uparrow time in sec
 \uparrow max ht in feet

Graphically:



Solve each equation algebraically. Show your work.

2. $x^2 - 6x + 8 = 0$

$$(x-4)(x-2) = 0$$

$$x-4=0 \quad x-2=0$$

$$x=4 \quad x=2$$

3. $\sqrt{x^2} = \sqrt{36}$

$$x = \pm 6$$

4. $3x^2 - 8 = -2$

$$3x^2 = 6$$

$$x^2 = 2$$

$$x = \pm \sqrt{2}$$

5. $3m^2 + 9 = 5$

$$3m^2 = -4$$

$$m^2 = -1.\bar{3}$$

$m = \text{No solution}$

6. $x^2 - x - 8 = 4$

$$x^2 - x - 12 = 0$$

$$(x-4)(x+3) = 0$$

$$x-4=0 \quad x+3=0$$

$$x=4 \quad x=-3$$

7. $5x^2 + 60x = 0$

$$5x(x+12) = 0$$

$$5x=0 \quad x+12=0$$

$$x = -12$$

8. $5x + x^2 - 3 = 0$

$$a = 1 \quad b = 5 \quad c = -3$$

$$\frac{-5}{2(1)} = \frac{-5}{2} = -2.5$$

$$(5)^2 + 4(1)(-3) = 37$$

$$x = -2.5 + \frac{\sqrt{37}}{2}$$

$$x = -2.5 - \frac{\sqrt{37}}{2}$$

9. $x^2 - 2x + 8 = 2$

$$x^2 - 2x + 6 = 0$$

$$a = 1 \quad b = -2 \quad c = 6$$

$$\frac{-2}{2(1)} = \frac{-2}{2} = -1$$

$$(-2)^2 - 4(1)(6) = -20$$

$$x = -1 + \frac{\sqrt{-20}}{2}$$

No Solution

$$x = -1 - \frac{\sqrt{-20}}{2}$$

Using your work in the previous problems to find the vertex algebraically.

10. $x^2 - 6x + 8 = 0$

$$\frac{4+2}{2} = 3$$

$$(3, -1)$$

$$3^2 - 6(3) + 8 = -1$$

11. $x^2 = 36$ $x^2 - 36 = 0$

$$\frac{6+(-6)}{2} = 0$$

$$(0, -36)$$

$$0^2 - 36 = -36$$

12. $5x^2 + 60x = 0$

$$\frac{0+(-12)}{2} = -6$$

$$(-6, -180)$$

$$5(-6)^2 + 60(-6) = -180$$