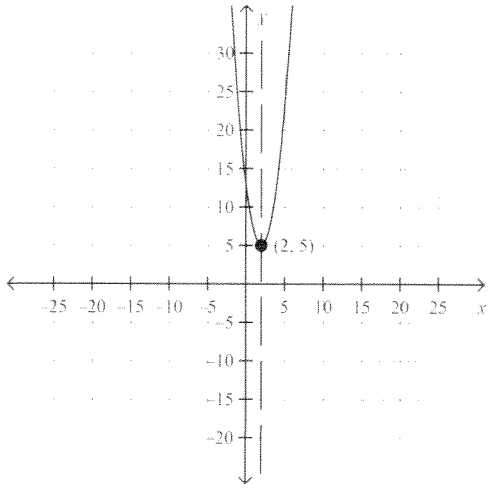
Quadratic Functions & Equations MSIP Assignment
Answer Section

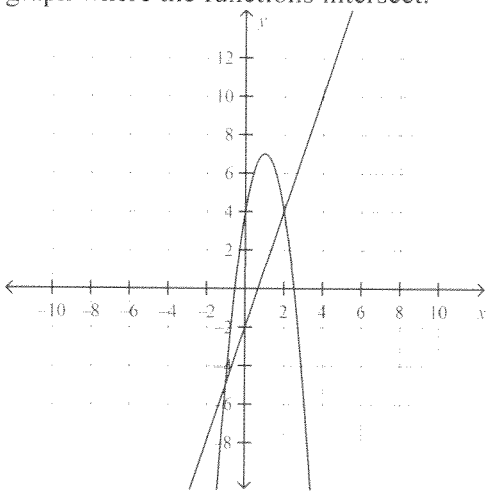
1. 

   Vertex: (2, 5)
   Axis of symmetry: $x = 2$
2. (0, –3)
3. The maximum height is 21 m. It reaches 21 m at 2 seconds.
4. $f(x) = -x^2 + 90x$; 2025 cm^2
5. No, Travis' throw did not reach Laura. The maximum height of the spike is 130 m at 2 seconds.
6. $f^{-1} = 1 \pm \sqrt{\frac{-x + 10}{3}}$; First I wrote the function in vertex form: $f(x) = -3(x - 1)^2 + 10$. I switched x and y in the function and solved for y. First I subtracted 10 from both sides, then I divided both sides by –3, took the square root of both sides, and finally I added 1 to both sides.
7. $f^{-1}(-15) = -8, -6$. First I wrote the function in vertex form and found the inverse by switching x and y and solving for y. I then substituted –15 for x and solved for y.
8. $8\sqrt{5} + 6\sqrt{15}$
9. $-103 - 73\sqrt{2}$
10. $24\sqrt{3} - 6\sqrt{5}$
11. 2.18 s
12. –20 and 20; I used the formula for the discriminant and substituted $a = 4$, $b = -k$, and $c = 25$ into $b^2 - 4ac$. I set the equation equal to zero and solved for k.
    $k^2 = 400$, so $k = \pm 20$.
13. $f(x) = -\frac{1}{3}(x^2 - 13)$ or $f(x) = -\frac{1}{3}x^2 + \frac{13}{3}$; I wrote the general function of all parabolas (factored form) that have zeros at $\pm\sqrt{13}$, which is $y = a(x - \sqrt{13})[x - (-\sqrt{13})]$. I multiplied the factors to get $y = a(x^2 - 13)$. I then substituted the point (–5, –4) for x and y and solved for a.
14. $f(x) = -\frac{4}{81}(x + 6)^2 - 6$ or $f(x) = -\frac{4}{81}x^2 - \frac{16}{27}x - \frac{70}{9}$; I wrote the vertex form of all parabolas that have a vertex at (–6, –6), which is $y = a(x + 6)^2 - 6$. I then substituted the point (3, –10) for x and y and solved for a.

15. $f(x) = -\frac{5}{8}x(x - 6)$ or $f(x) = -\frac{5}{8}x^2 + \frac{15}{4}x$

16. $f(x) = 2(x^2 - 6x + 4)$ or $f(x) = 2x^2 - 12x + 8$; I wrote the general function of all parabolas (factored form) that have zeros at $3 + \sqrt{5}$ and $3 - \sqrt{5}$, which is $y = a(x - 3 + \sqrt{5})(x - 3 - \sqrt{5})$. I multiplied the factors to get $y = a(x^2 - 6x + 4)$. I then substituted the point $(1, -2)$ for x and y and solved for a.

17. $(-1, -5)$, $(2, 4)$; I graphed the two functions by making a table of values for each. I then located the points on the graph where the functions intersect.



18. a) $f(x) = -x^2 + 60x$
    b) 900 m^2
    c) length = 30 m, width = 30 m

19. $4\sqrt{14}$

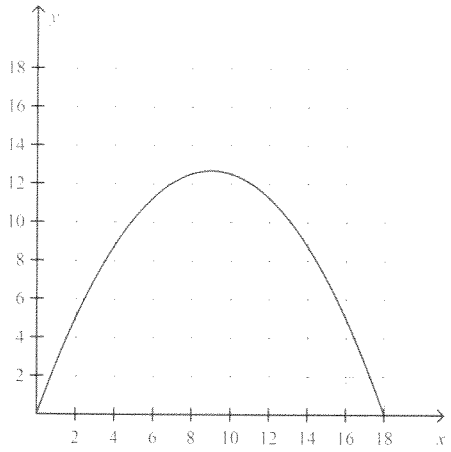
20. $15\sqrt{3}$ cm; The area of a square is side × side or $side^2$. So, to find the length of a side, I took the square root of 675. I simplified by taking the square root of 225 to get $15\sqrt{3}$.

21. a) 2.17 m
    b) 15.66 m by 7.66 m

22. There are two zeros. I simplified the function to $f(x) = -4x^2 + 22x - 3$ and calculated the discriminant to get 436. Since the discriminant is greater than zero, the function has two zeros.

23. a) $f(x) = -\frac{5}{32}x(x - 18)$

b)



c) Yes, the truck can pass through the tunnel. The height of the tunnel is greater than 8 m for about 10 m in width, so there is enough room for the truck to pass through.

24. a) about 27.5 m
b) about 0.93 s