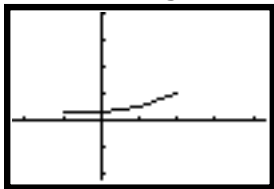


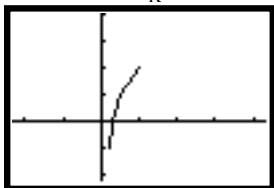
f^{-1} :

$D = \{x \mid -2 \leq x \leq 3.07, x \in \mathbf{R}\}$ and $R = \{y \mid -0.3 \leq y \leq 2, y \in \mathbf{R}\}$

iv. (a) $f(x) = \frac{1}{3-x}, -1 \leq x \leq 2$



$f^{-1}(x) = 3 - \frac{1}{x}$



f :

$D = \{x \mid -1 \leq x \leq 2, x \in \mathbf{R}\}$

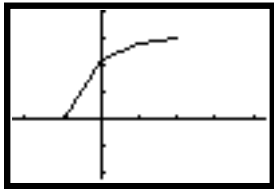
$f(-1) = 0.25$ and $f(2) = 1$

Thus, the $R = \{y \mid 0.25 \leq y \leq 1, y \in \mathbf{R}\}$

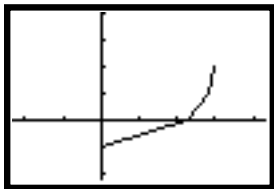
f^{-1} :

$D = \{x \mid 0.25 \leq x \leq 1, x \in \mathbf{R}\}$ and $R = \{y \mid -1 \leq y \leq 2, y \in \mathbf{R}\}$

(b) $g(x) = \sqrt{9 - (x-2)^2}, -1 \leq x \leq 2$



$g^{-1}(x) = \sqrt{9 - x^2} + 2$



g :

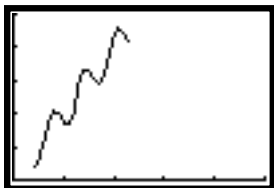
$D = \{x \mid -1 \leq x \leq 2, x \in \mathbf{R}\}$

$g(-1) = 0$ and $g(2) = 3$. Thus, the $R = \{y \mid 0 \leq y \leq 3, y \in \mathbf{R}\}$

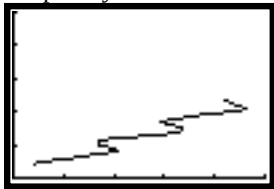
g^{-1} :

$D = \{x \mid 0 \leq x \leq 3, x \in \mathbf{R}\}$ and $R = \{y \mid -1 \leq y \leq 2, y \in \mathbf{R}\}$

(c) $y = 2x + 0.5 \sin(10x)$



Graph of y^{-1} :



y :

$D = \{x \mid 0.4 \leq x \leq 2.3, x \in \mathbf{R}\}$

Using the **max** function on the calculator we find that if $x \doteq 2.083$, then $y \doteq 4.625$

Using the **min** function on the calculator we find that if $x \doteq 0.430$, then $y \doteq 0.4019$

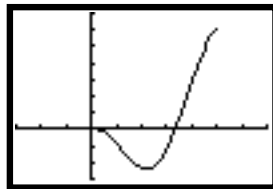
Thus, the $R = \{y \mid 0.4019 < y < 4.625, y \in \mathbf{R}\}$

y^{-1} :

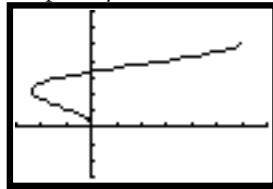
$D = \{x \mid 0.4019 < x < 4.625, x \in \mathbf{R}\}$ and

$R = \{y \mid 0.4 \leq y \leq 2.3, y \in \mathbf{R}\}$

(d) $f(x) = -1.2x \sin(x - 0.2), 0 \leq x \leq 5$



Graph of f^{-1} :



f :

$D = \{x \mid 0 \leq x \leq 5, x \in \mathbf{R}\}$

Using the **min** function on the calculator, we find that if $x \doteq 2.1978$, then $f(x) \doteq 2.4006$

$f(5) \doteq 5.97699$, and this is the highest point.

Thus, the $R = \{y \mid -2.4006 < y < 5.97699, y \in \mathbf{R}\}$

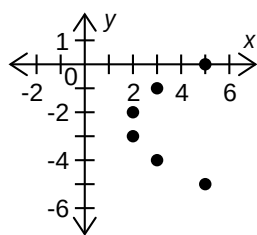
f^{-1} :

$D = \{x \mid -2.4006 < x < 5.97699, x \in \mathbf{R}\}$ and

$R = \{y \mid 0 \leq y \leq 5, y \in \mathbf{R}\}$

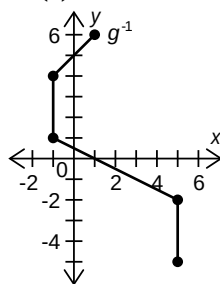
Practise, Apply, Solve 3.6, page 273

1. (a)



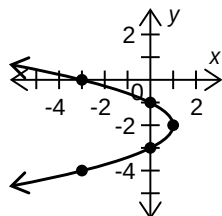
(b) A subset of f^{-1} which is a function is $\{(2, -3), (3, -4), (5, -5)\}$. There are several possibilities.

2. (a)



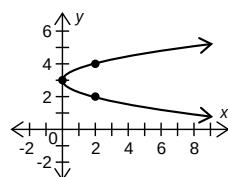
- (b) $D = \{x \mid -5 \leq x \leq 6, x \in \mathbf{R}\}$, $R = \{y \mid -1 \leq y \leq 5, y \in \mathbf{R}\}$
 (c) $D = \{x \mid -1 \leq x \leq 5, x \in \mathbf{R}\}$, $R = \{y \mid -5 \leq y \leq 6, y \in \mathbf{R}\}$
 (d) If we restrict the domain of g so that $-2 \leq x \leq 1$, then g^{-1} would be a function and have the same domain as g^{-1} .

3. (a) i. No restrictions are necessary. It is already a function.
 ii.



iii. If we restrict the domain of the original relation so that $x \geq -2$ or $x \leq -2$, then its inverse will be a function.

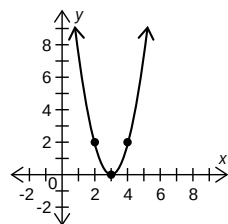
(b) i. No restrictions are necessary. It is already a function.
 ii.



iii. If we restrict the domain of the original relation so that $x \geq 3$ or $x \leq 3$, then its inverse will be a function.

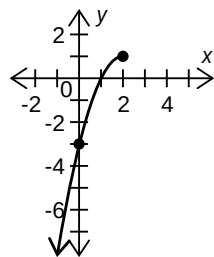
(c) i. If we restrict the range of the relation so that $y \geq 3$ or $y \leq 3$, then it will be a function.

ii.



iii. No restrictions are necessary. The inverse is already a function.

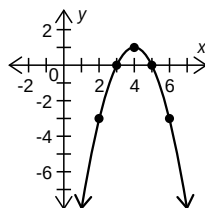
(d) i. No restrictions are necessary. It is already a function.
 ii.



iii. No restrictions are necessary. The inverse is already a function.

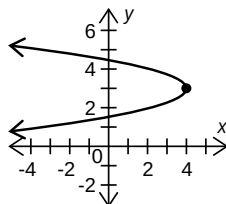
(e) i. If we restrict the range of the original relation so that $y \geq 4$ or $y \leq 4$, then it will be a function.

ii.



iii. No restrictions are necessary. The inverse is already a function.

(f) i. No restrictions are necessary. It is already a function.
 ii.

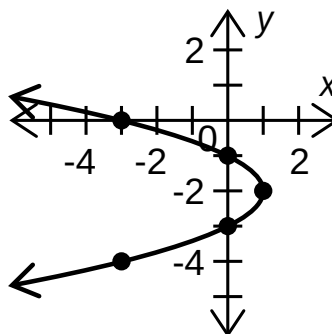


iii. If we restrict the domain of the original relation so that $x \geq 3$ or $x \leq 3$, then its inverse will be a function.

4. (a) i. The vertex is at (4, 1). So, the parabola is of the form: $y = a(x - 4)^2 + 1$. But, (5, 0) is on the parabola, so:
 $0 = a(5 - 4)^2 + 1$
 $a = -1$

Now, $f(x) = -(x - 4)^2 + 1$

ii.



iii. If we restrict the domain so that $x \geq 4$ or $x \leq 4$, its inverse will be a function.

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

so

$$x = -(y - 4)^2 + 1$$

$$-x + 1 = (y - 4)^2$$

$$\pm\sqrt{-x + 1} = y - 4$$

$$y = \pm\sqrt{-x + 1} + 4$$

$$f^{-1}(x) = \pm\sqrt{-x + 1} + 4$$

(b) i. The vertex is at (1, -3). So, the parabola is of the form: $y = a(x - 1)^2 - 3$. But, (0, -2) is on the parabola, so:

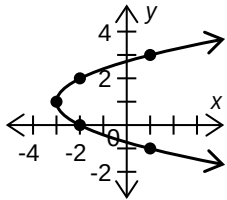
$$-2 = a(0 - 1)^2 - 3$$

$$-2 = a - 3$$

$$a = 1$$

$$\text{Now, } f(x) = (x - 1)^2 - 3$$

ii.



iii. If we restrict the domain so that $x \geq 1$ or $x \leq -1$, its inverse will be a function.

iv. $f(x): y = (x-1)^2 - 3$

so:

$$x = (y-1)^2 - 3$$

$$x+3 = (y-1)^2$$

$$\pm\sqrt{x+3} = y-1$$

$$y = \pm\sqrt{x+3} + 1$$

$$f^{-1}(x) = \pm\sqrt{x+3} + 1$$

(c) i. The vertex is at $(-3, -2)$. So, the parabola is of the form:

$y = a(x+3)^2 - 2$. But, $(-4, -1)$ is on the parabola, so:

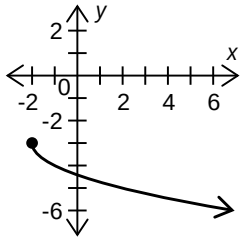
$$-1 = a(-4+3)^2 - 2$$

$$-1 = a - 2$$

$$a = 1$$

$$\text{Now, } f(x) = (x+3)^2 - 2, x \leq -3$$

ii.



iii. No restrictions are necessary. The inverse is already a function.

iv. $f(x): y = (x+3)^2 - 2, x \leq -3$ so:

$$x = (y+3)^2 - 2, y \leq -3$$

$$x+2 = (y+3)^2$$

$$\pm\sqrt{x+2} = y+3$$

$$\pm\sqrt{x+2} - 3 = y$$

but if $y \leq -3$, then:

$$y = -\sqrt{x+2} - 3$$

$$f^{-1}(x) = -\sqrt{x+2} - 3$$

(d) i. This is the inverse of a parabola with vertex at $(3, 2)$.

So, by interchanging x and y in the equation $y = a(x-3)^2 + 2$, we find that the parabola is of the form: $x = a(y-3)^2 + 2$.

But, $(1, 4)$ is also on the parabola, so:

$$1 = a(4-3)^2 + 2$$

$$1 = a + 2$$

$$a = -1$$

$$\text{Now, } x = -(y-3)^2 + 2, y \geq 3$$

$$(y-3)^2 = -x+2$$

$$y-3 = \pm\sqrt{-x+2}$$

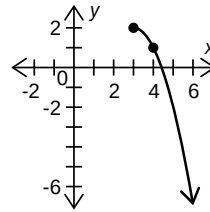
$$y = 3 \pm \sqrt{-x+2}$$

but since $y \geq 3$, then:

$$y = 3 + \sqrt{-x+2}$$

$$f(x) = 3 + \sqrt{-x+2}$$

ii.



iii. No restrictions are necessary. The inverse is already a function.

iv. $f(x): y = 3 + \sqrt{-x+2}$

so:

$$x = 3 + \sqrt{-y+2}$$

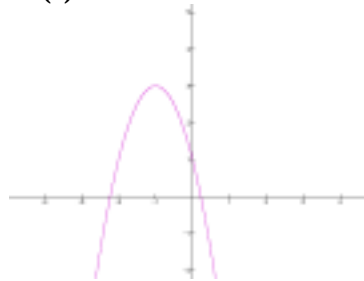
$$x-3 = \sqrt{-y+2}$$

$$(x-3)^2 = -y+2$$

$$y = -(x-3)^2 + 2$$

$$f^{-1}(x) = -(x-3)^2 + 2, x \geq 3$$

5. (a)



(b) First, find the inverse of $f(x)$.

$$y = -2(x+1)^2 + 3$$

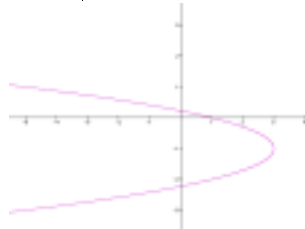
$$x = -2(y+1)^2 + 3$$

$$x-3 = -2(y+1)^2$$

$$\frac{x-3}{-2} = (y+1)^2$$

$$\pm\sqrt{\frac{x-3}{-2}} = y+1$$

$$y = \pm\sqrt{\frac{x-3}{-2}} - 1$$

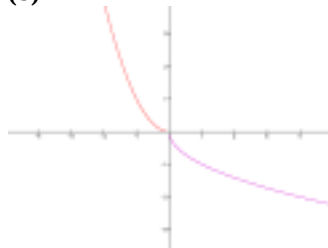


(c) If we restrict the domain of f so that $x \geq -1$ or $x \leq -1$, then both f and f^{-1} will be functions.

6. (a)



(b)



(c) $D = \{x \mid x \leq 0, x \in \mathbf{R}\}$ and $R = \{y \mid y \geq 0, y \in \mathbf{R}\}$

(d) $g(x): y = -\sqrt{x}, x \geq 0$

so:

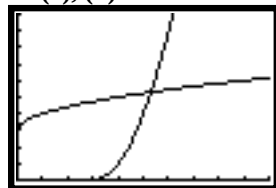
$$x = -\sqrt{y}$$

$$x^2 = (-\sqrt{y})^2$$

$$x^2 = y$$

$$g^{-1}(x) = x^2, y \geq 0$$

7. (a), (b)



(c) $g(x): y = 3 + \sqrt{x}$

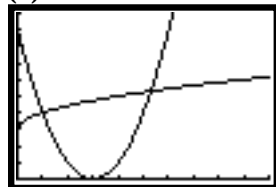
$$x = 3 + \sqrt{y}$$

$$x - 3 = \sqrt{y}$$

$$(x - 3)^2 = y$$

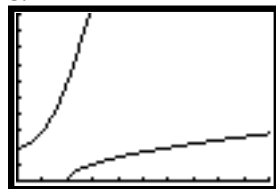
$$g^{-1}(x) = (x - 3)^2$$

(d)



(e) We need $T_{\min} = 3$ in order to get the correct graph and no “extra” points.

8.



(c) $f(x): y = \sqrt{x - 2}$

$$x = \sqrt{y - 2}$$

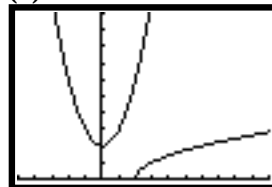
$$x^2 = (\sqrt{y - 2})^2$$

$$x^2 = y - 2$$

$$y = x^2 + 2$$

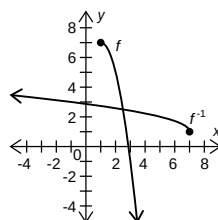
$$f^{-1}(x) = x^2 + 2$$

(d)



(e) We need $T_{\min} = 0$ to get the correct graph and no “extra” points.

9.



(a) $f(3) = 7 - 2(3 - 1)^2 = 7 - 2(2)^2 = 7 - 8 = -1$

(b) $f(x): y = 7 - 2(x - 1)^2, x \geq 1$

$$x = 7 - 2(y - 1)^2, y \geq 1$$

$$2(y - 1)^2 = 7 - x$$

$$(y - 1)^2 = \frac{7 - x}{2}$$

$$y - 1 = \pm \sqrt{\frac{7 - x}{2}}$$

$$y = 1 \pm \sqrt{\frac{7 - x}{2}}$$

since $y \geq 1$, then:

$$y = 1 + \sqrt{\frac{7 - x}{2}}$$

$$f^{-1}(x) = 1 + \sqrt{\frac{7 - x}{2}}$$

(c)

$$f^{-1}(5) = 1 + \sqrt{\frac{7 - 5}{2}}$$

$$= 1 + \sqrt{\frac{2}{2}}$$

$$= 1 + \sqrt{1}$$

$$= 2$$

(d)

$$\begin{aligned}
 f^{-1}(2a+7) &= 1 + \sqrt{\frac{7-(2a+7)}{2}} \\
 &= 1 + \sqrt{\frac{7-2a-7}{2}} \\
 &= 1 + \sqrt{\frac{-2a}{2}} \\
 &= 1 + \sqrt{-a}
 \end{aligned}$$

(e)

$$\begin{aligned}
 &7 - 2(f^{-1}(x) - 1)^2 \\
 &= 7 - 2\left(1 + \sqrt{\frac{7-x}{2}} - 1\right)^2 \\
 &= 7 - 2\left(\sqrt{\frac{7-x}{2}}\right)^2 \\
 &= 7 - 2\left(\frac{7-x}{2}\right) \\
 &= 7 - 7 + x \\
 &= x
 \end{aligned}$$

10. (a) $f(x) = -x^2 + 6x + 5$

$$= -(x^2 - 6x) + 5$$

$$= -(x^2 - 6x + 9 - 9) + 5$$

$$= -(x-3)^2 + 9 + 5$$

$$= -(x-3)^2 + 14$$

Thus, the vertex is at (3, 14)

(b) Since this is a parabola opening down, by restricting the domain so that $x \geq 3$, its inverse will be a function.

(c) $f(x): y = -(x-3)^2 + 14, x \geq 3$

$$x = -(y-3)^2 + 14, y \geq 3$$

$$(y-3)^2 = -x + 14$$

$$y-3 = \pm\sqrt{-x+14}$$

$$y = 3 \pm \sqrt{-x+14}$$

but $y \geq 3$ so:

$$f^{-1}(x) = 3 + \sqrt{-x+14}$$

Similarly, if $f(x)$ were restricted so that $x \leq 3$, then

$$f^{-1}(x) = 3 - \sqrt{-x+14}.$$

11. For $-2 < x < 3$, $f(x) = 3x^2 - 6x$

(a) $f(x) = 3x(x-2)$

This is a parabola with zeros at $x = 0$ and $x = 2$. Thus, the x -coordinate of the vertex is $x = 1$.

$$f(1) = 3(1)(1-2) = 3(-1) = -3$$

The vertex is at (1, -3)

$$f(-2) = 3(-2)(-2-2) = -6(-4) = 24$$

$$f(3) = 3(3)(3-2) = 9(1) = 9$$

$$D = \{x \mid -2 < x < 3, x \in \mathbf{R}\}$$

$$R = \{y \mid -3 \leq y < 24, y \in \mathbf{R}\}$$

(b) $f(x): y = 3x^2 - 6x, -2 < x < 3$

$$x = 3y^2 - 6y$$

$$x = 3(y^2 - 2y)$$

$$x = 3(y^2 - 2y + 1 - 1)$$

$$x = 3(y-1)^2 - 3$$

$$x + 3 = 3(y-1)^2$$

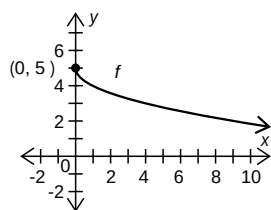
$$\frac{x+3}{3} = (y-1)^2$$

$$y-1 = \pm\sqrt{\frac{x+3}{3}}$$

$$y = 1 \pm \sqrt{\frac{x+3}{3}}$$

$$f^{-1}(x) = 1 \pm \sqrt{\frac{x+3}{3}}, -2 < y < 3$$

12.



(a) $D = \{x \mid x \geq 0, x \in \mathbf{R}\}$, $R = \{y \mid y \leq 5, y \in \mathbf{R}\}$

(b) $f(x): y = -\sqrt{x} + 5$

$$x = -\sqrt{y} + 5$$

$$x - 5 = -\sqrt{y}$$

$$(x-5)^2 = (-\sqrt{y})^2$$

$$(x-5)^2 = y$$

$$f^{-1}(x) = (x-5)^2, x \leq 5$$

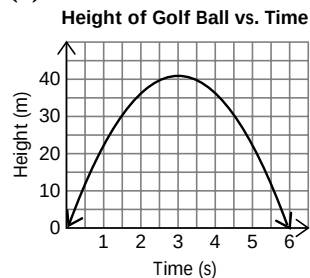
13. The inverse of $y = x^2$ is $y = \pm\sqrt{x}$, so $y = \sqrt{x}$ is one of the branches of the inverse of $y = x^2$. The inverse of $y = \sqrt{x}$ is the right-hand branch of $y = x^2$ (i.e. $y = x^2$, where $x \geq 0$).

14. (a)

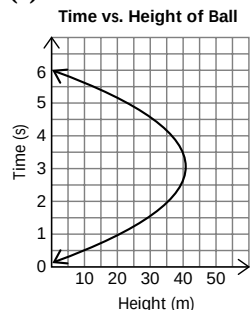
Time (s)	Height (s)	1st diff.	2nd dif.
0	0	12.375	-2.25
0.5	12.375	10.125	-2.25
1.0	22.5	7.875	-2.25
1.5	30.375	5.625	-2.25
2.0	36.0	3.375	-2.25
2.5	39.375	1.125	-2.25
3.0	40.5	-1.125	-2.25
3.5	39.375	-3.375	-2.25
4.0	36.0	-5.625	-2.25
4.5	30.375	-7.875	-2.25
5.0	22.5	-10.125	-2.25

Since the 2nd differences are constant, the relation is quadratic.

(b)



(c)

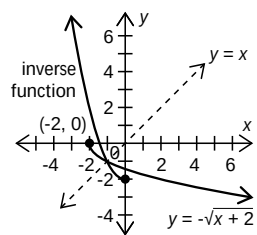


(d) The inverse is not a function because it fails the vertical line test.

15. $y = -\sqrt{x+2}$ defines the lower branch of a parabola. From the equation we can see that $x \geq -2$ and that $y \leq 0$. It is a parabola that opens to the right (since $x \geq -2$). If $y \geq 0$, we get the upper portion of the graph.

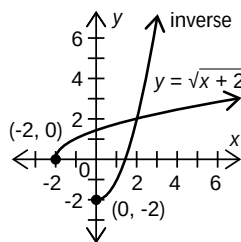
The inverse of this function is a single branch of the parabola opening up, since it is the reflection of $y = -\sqrt{x+2}$ in the line $y = x$.

The graph of $y = x^2 - 2$ is a parabola (both branches) with vertex at $(0, -2)$, so it cannot be the inverse of $y = -\sqrt{x+2}$. However, if we restrict the domain of $y = x^2 - 2$ to $x \leq 0$, then it would be the inverse of $y = -\sqrt{x+2}$.



16. No, $y = \sqrt{x+2}$ is the upper branch of a parabola opening to the right with vertex at $(-2, 0)$.

Its inverse is a function already without any restrictions, because it is a portion of a parabola opening up with its vertex at $(0, -2)$.



17. (a) $f(x)$ = the input digit $\times 2$ less than the input digit
Thus, $f(x) = x(x-2)$ where $0 \leq x \leq 9$, $x \in \mathbf{W}$.

(b) $f(x): y = x(x-2)$, $0 \leq x \leq 9$, $x \in \mathbf{W}$

so:

$$x = y(y-2)$$

$$x = y^2 - 2y \quad \text{Complete the square on the right side.}$$

$$x = y^2 - 2y + 1 - 1$$

$$x = (y-1)^2 - 1$$

$$x+1 = (y-1)^2$$

$$y-1 = \pm\sqrt{x+1}$$

$$y = 1 \pm \sqrt{x+1}$$

$$f^{-1}(x) = 1 \pm \sqrt{x+1}, \quad 0 \leq y \leq 9, \quad y \in \mathbf{W}$$

(c) f^{-1} is not a function because each x value does not correspond to a unique y value.

e.g.

$$f^{-1}(0) = 1 \pm \sqrt{0+1}$$

$$= 1 \pm 1$$

$$= 2 \text{ or } 0$$

$$(d) f(2) = 2(2-2) = 2(0) = 0$$

$$f(3) = 3(3-2) = 3(1) = 3$$

$$f(4) = 4(4-2) = 4(2) = 8$$

$$f(5) = 5(5-2) = 5(3) = 15$$

$$\text{If } 2 \leq x \leq 5, \mathbf{R} = \{0, 3, 8, 15\}.$$

(e) If $1 \leq y \leq 16$, then the input digits will be 3, 4, or 5.

(f) In order for f to be a function, we can restrict the domain so that $1 \leq x \leq 9$, $x \in \mathbf{W}$. In order for f^{-1} to be a function, we can restrict the range so that $1 \leq y \leq 9$, $y \in \mathbf{W}$. The restriction on f is important so that the digits of a specific credit card correspond to a unique coded set of digits. The restriction on f^{-1} is important so that when you decode the coded set of digits you receive only the original credit card digits.

18. To graph the inverse of a function, reflect the original graph in the line $y = x$. If the original function passes the horizontal line test (no two points of the function lie on the same horizontal line), then its inverse is a function. If it fails this test, then restrict the domain of the function so that no two points are on the same horizontal line.

$$19. (a) m(x) = 14\,700 - 3040x$$

$$\begin{aligned} \text{profit/kg ground beef} &= \text{price/kg} - \text{cost/kg} \\ &= \$x - \$3.21 \end{aligned}$$

$$\text{total profit(\$)} = \text{profit(\$ / kg)} \times \text{mass sold(kg)}$$

$$P(x) = (x - 3.21)(14\,700 - 3040x)$$

$$\begin{aligned}
 \text{(b)} P(x) &= (x - 3.21)(14\,700 - 3040x) \\
 &= -3040x^2 + 14\,700x + 9758.4x - 47187 \\
 &= -3040x^2 + 24\,458.4x - 47\,187 \\
 &= -3040(x^2 - 8.0455x) - 47\,187 \\
 &= -3040(x^2 - 8.0455x + 16.182\,517\,56 - 16.182\,517\,56) \\
 &\quad - 47\,187 \\
 &= -3040(x - 4.022\,75)^2 + 49\,194.853\,39 - 47\,187 \\
 &= -3040(x - 4.02)^2 + 2008 \\
 \text{Thus, } P(x) &= y = -3040(x - 4.02)^2 + 2008
 \end{aligned}$$

so:

$$x = -3040(y - 2008)^2 + 2008$$

$$3040(y - 4.02)^2 = -x + 2008$$

$$(y - 4.02)^2 = \frac{-x + 2008}{3040}$$

$$y - 4.02 = \pm \sqrt{\frac{-x + 2008}{3040}}$$

$$y = 4.02 \pm \sqrt{\frac{-x + 2008}{3040}}$$

$$P^{-1}(x) = 4.02 \pm \sqrt{\frac{-x + 2008}{3040}}$$

(c) $P(x)$ requires price/kg and produces profit.
 $P^{-1}(x)$ requires total profit and produces price/kg.
 For a profit of \$1900, evaluate:

$$\begin{aligned}
 P^{-1}(1900) &= 4.02 \pm \sqrt{\frac{-1900 + 2008}{3040}} \\
 &\doteq 4.21 \text{ or } 3.83
 \end{aligned}$$

Thus, if he charges approximately \$4.21/kg or \$3.83/kg he can expect a total profit of \$1900.

If he charges \$3.83/kg, he will only make \$0.62 profit/kg, but will sell enough to make \$1900 in total profit.

If he charges \$4.21/kg, he will make more profit/kg, but will sell much less, resulting in the same total profit.

$$\text{(d)} P(x) = -3040(x - 4.02)^2 + 2008$$

This is a parabola that opens downward with its vertex at (4.02, 2008). Thus, he should set the price at \$4.02/kg to get a maximum total profit of \$2008.

(e) If the supply cost drops to \$3.10/kg, then the new profit model would be: $P(x) = (x - 3.10)(14\,700 - 3040x)$

This has zeroes at $x = 3.1$ and $x = \frac{14\,700}{3040} \doteq 4.8355$.

The x-coordinate of the vertex is: $x = \frac{3.1 + 4.8355}{2} \doteq 3.97$.

$$P(3.97) = (3.97 - 3.1)(14\,700 - 3040(3.97)) \doteq 2290$$

Thus, if the supply cost drops to \$3.10/kg, the manager should set the price at \$3.97/kg. He would make about \$2290 in total profit.

(f)

Supply cost(\$/kg)	Zeroes	x-coordinate
3.21	$4.8355 + 3.21$	4.02
3.10	$4.8355 + 3.10$	3.97
2.50	$4.8355 + 2.50$	3.67
2.00	$4.8355 + 2.00$	3.42
4.00	$4.8355 + 4.00$	4.42
4.80	$4.8355 + 4.80$	4.82

x	$P(x)$	Profit: $P(x)$
4.02	$(x - 3.21)(14\,700 - 3040x)$	\$2008
3.97	$(x - 3.1)(14\,700 - 3040x)$	\$2290
3.67	$(x - 2.5)(14\,700 - 3040x)$	\$4146
3.42	$(x - 2)(14\,700 - 3040x)$	\$6110
4.42	$(x - 4)(14\,700 - 3040x)$	\$531
4.82	$(x - 4.8)(14\,700 - 3040x)$	\$0.94

(g) The main reason that demand rises for ground beef when the manager lowers his price is that customers from other stores come to his store to buy his beef. If supply costs drop, they would drop for everyone, so the formula $m(x)$ would no longer be valid. For example, if the supply cost of ground beef rose to \$4.84/kg, our current model suggests that no one would buy the beef, even if the manager only charged \$4.84/kg. While demand for ground beef would drop if the price rose that high, there would still be some people willing to buy it. If the manager sells it at his cost, he will get many customers from other stores because they are likely to try to earn a profit on it.

$$20. \text{ Given } -2 < x < 3 \text{ and } f(x) = \frac{1}{x}$$

Substitute -2 and 3 into $f(x)$ to find the upper and lower bounds of the range.

$$f(-2) = -\frac{1}{2} \text{ and } f(3) = \frac{1}{3}$$

The value of y can be anything greater than $\frac{1}{3}$ or anything less than $-\frac{1}{2}$.

$$\text{Range} = \{y \mid y > \frac{1}{3} \text{ or } y < -\frac{1}{2}, y \in \mathbb{R}\}$$

Practise, Apply, Solve 3.7, page 285

1. The Base Function determines the shape that is preserved after the transformations. For example if $f(x) = x^2$, then the graph of $y = 3f(x - 2) + 7$ will be the same shape as $f(x)$, but will be stretched and translated into a new position. The reflections, translations and stretches do not change the basic shape of the graph.

$$\begin{array}{l}
 2. \boxed{x} \rightarrow \boxed{+2} \rightarrow \boxed{f} \rightarrow \boxed{y} \\
 \boxed{-1} \leftarrow \boxed{-2} \leftarrow \boxed{(1, 5)} \rightarrow \boxed{5} \\
 \boxed{0} \leftarrow \boxed{-2} \leftarrow \boxed{(2, 3)} \rightarrow \boxed{3} \\
 \boxed{1} \leftarrow \boxed{-2} \leftarrow \boxed{(3, 7)} \rightarrow \boxed{7}
 \end{array}$$

Thus, $(-1, 5)$, $(0, 3)$, and $(1, 7)$ are three points on g .

$$3. \text{ (a) } (1, 4), (2, 10), (3, 14), (4, 16) \text{ satisfy } y = 2g(x)$$

$$\begin{array}{ccc}
 x & \xrightarrow{\boxed{g}} & \xrightarrow{\boxed{\times 2}} y \\
 1 & & 4 \\
 2 & & 10 \\
 3 & & 14 \\
 4 & & 16
 \end{array}$$