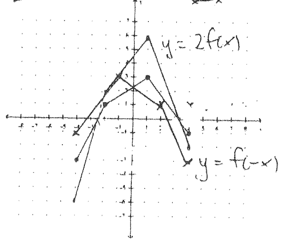
8 e) $y = (2x)^3$ H. compression by a factor of 2

funct. notation: $y = f(2x)$

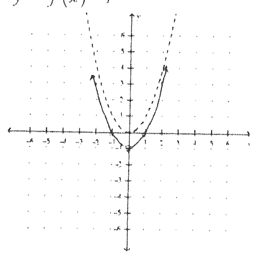
f) $y = 4f\left[\frac{1}{2}(x+1)\right]$ V. stretch by a factor of 4
H. stretch by a factor of 2
H translation left 1 unit

9. The graph of $y = f(x)$ is shown below. On the same set of axes, graph the desired transformations.

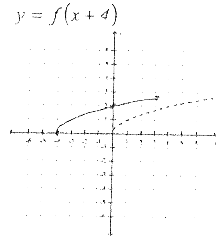
a) $y = 2f(x)$ and $y = f(-x)$



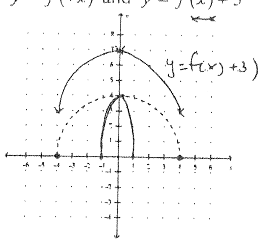
b) $y = f(x) - 1$



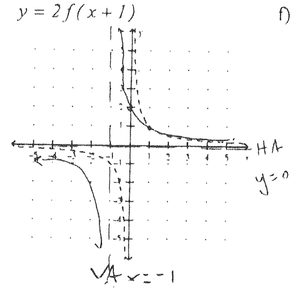
c) $y = f(x+4)$



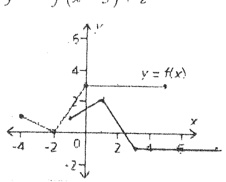
d) $y = f(4x)$ and $y = f(x) + 3$



e) $y = 2f(x+1)$



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

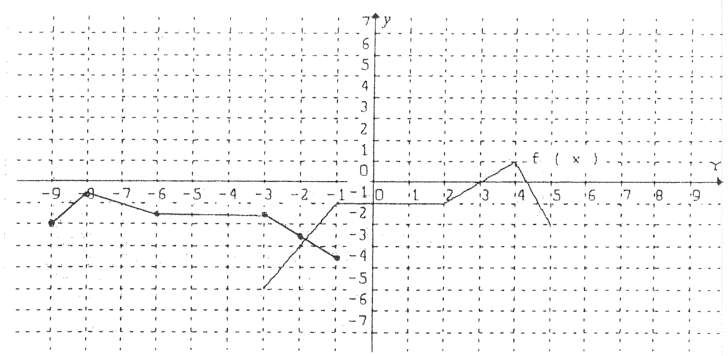


11) $y = 0.5f[-(x+4)] - 1$

Vertical compression by a factor of 2
Reflection along the y-axis
Horizontal translation 4 units left
Vertical translation 1 unit down.

Key points

$-x-4$	$-x$	x	y	$\frac{1}{2}y$	$\frac{1}{2}y-1$
-1	3	-3	-5	-2.5	-3.5
-3	1	-1	-1	-0.5	-1.5
-6	-2	2	-1	-0.5	-1.5
-8	-4	4	1	0.5	-0.5
-9	-5	5	-2	-1	-2



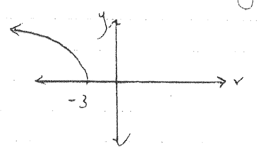
4) a) D: $\{x \mid x = -5, \frac{1}{4}, \frac{1}{3}, 2, 5, 7\}$

R: $\{y \mid y = -3, -2, \frac{1}{2}, 3, 4, 6\}$

b) D: $\{x \mid x \in R\}$ R: $\{y \mid y < 1.8, y \in R\}$

c) D: $\{x \mid x \in R\}$ R: $\{y \mid y < 5, y \in R\}$

d) sketch This is $y = \sqrt{x}$ v. stretch by a factor of 2 Reflected along y axis shifted left 3



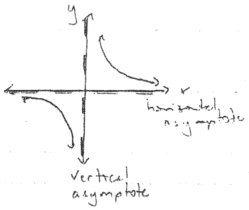
D: $\{x \mid x \leq -3, x \in R\}$

R: $\{y \mid y \geq 0, y \in R\}$

5) $f(x) = \sqrt{x}$
D: $\{x \mid x \geq 0, x \in R\}$
R: $\{y \mid y \geq 0, y \in R\}$

x-int = 0, y-int = 0

6)

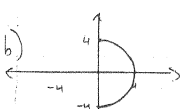


Vertical asymptote $x = 0$
horizontal asymptote: $y = 0$
pts. $(\frac{1}{2}, 2), (1, 1), (2, \frac{1}{2})$
$(-\frac{1}{2}, -2), (-1, -1), (-2, -\frac{1}{2})$

7a) pts: $\{(-2,3), (0,4), (2,5), (3,4), (5,2), (6,1)\}$
inverse: $\{(3,-2), (4,0), (5,2), (4,3), (2,5), (1,6)\}$

The original relation is a function since each x has only one y value; the inverse is not a function since the value of x=4 has two y values.

b)



The original, semi-circle is a function but the inverse is not since it does not pass the vertical line test.

7c) $2x + 3y = 6$
inverse: $2y + 3x = 6$

Both relations are lines ∴ they are functions

d) $y = \sqrt{x+3}$, $x \geq -3$, $y \geq 0$
inverse $x = \sqrt{y+3}$
$x^2 = y+3$
$x^2 - 3 = y$ $y \geq -3$, $x \geq 0$

The original relation is a square root function and the inverse is a portion of a parabola $(x \geq 0)$, ∴ also a function

e) $y = \frac{1}{x+3}$, $x \neq -3$, $y \neq 0$
↑ V.A ↑ H.A.
inverse: $x = \frac{1}{y+3}$
$(y+3)x = 1$
$y + 3 = \frac{1}{x}$

$y = \frac{1}{x} - 3$, $x \neq 0$, $y \neq -3$
↑ V.A. ↑ H.A.

Both the original and the inverse are reciprocal functions

f) $\{(1,2), (-3,5), (10,-4)\}$

inverse: $\{(2,1), (5,-3), (-4,10)\}$

Both relations are functions since each x has only one y value.

8a) $y = 3\sqrt{x}$
fnct. notation: $y = 3f(x)$

v. stretch by a factor of 3

b) $y = \frac{-1}{x}$
fnct. notation: $y = -f(x)$

reflection along the x-axis

c) $y = (x-3)^2$;
fnct. notation: $y = f(x-3)$

H. translation right 3 units

d) $y = x - 5$
fnct notation: $y = f(x) - 5$

V. translation down 5 units

U2 Review Answers

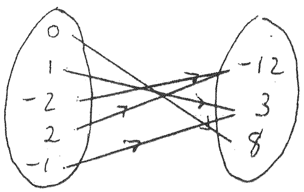
1) $y = -5x^2 + 8$ (eq'n form)

x	y
-2	-12
-1	3
0	8
1	3
2	-12

(table of values)
$x \in \mathbb{R}$

$\{(-2,-12), (-1,3), (0,8), \ldots\}$ (set of ordered pairs)

$x \rightarrow$ squared $\rightarrow$ mult by -5 $\rightarrow$ add 8 $\rightarrow y$ (input/output)

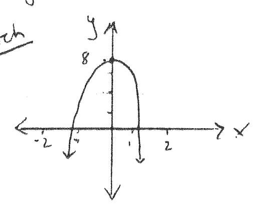


(arrow diagram)

"The product of -5 and x squared increased by 8"
(in words - Many different answers!)

$y = -5f(x) + 8$, where $f(x) = x^2$ (function notation)

sketch



(graph)

2) a) A line is a function since an x has only one value of y.
b) This is not a function an x has multiple values of y
c) This inverse of a parabola is not a function since there are x's that have more than one y value. →

2) d) This table of values does not represent a function since the x value of -5 has two different y values.

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

a) $f(-2) = 2(-2)^2 - 3(-2) + 5$
$= 2(4) - (-6) + 5$
$= 8 + 6 + 5$
$= 19$

b) $f(\frac{1}{3}) = 2(\frac{1}{3})^2 - 3(\frac{1}{3}) + 5$
$= 2(\frac{1}{9}) - \frac{3}{1}(\frac{1}{3}) + 5$
$= \frac{2}{9} - 1 + 5$
$= \frac{2}{9} - \frac{9}{9} + \frac{45}{9}$
$= \frac{38}{9}$

c) $f(0) = 2(0)^2 - 3(0) + 5$
$= 5$

d) $f(2x) = 2(2x)^2 - 3(2x) + 5$
$= 2(4x^2) - 6x + 5$
$= 8x^2 - 6x + 5$

e) $f(x-1) = 2(x-1)^2 - 3(x-1) + 5$
$= 2(x-1)(x-1) - 3x + 3 + 5$
$= 2(x^2 - 2x + 1) - 3x + 8$
$= 2x^2 - 4x + 2 - 3x + 8$
$= 2x^2 - 7x + 10$

f) $f(a) = 2a^2 - 3a + 5$
$4 = 2a^2 - 3a + 5 - 4$
$0 = 2a^2 - 3a + 1$
$0 = (2a-1)(a-1)$

$S = -3$
$P = 2$
$I = -2, -1$

$2a - 1 = 0$ or $a - 1 = 0$
$2a = 1$ $\quad a = 1$
$a = \frac{1}{2}$

$\{\frac{1}{2}, 1\}$