Unit 7 Pre-Test Review – Graphing
MHF4U
Jensen

SOLUTIONS

1) Sketch a graph of each of the following logarithmic functions by applying transformations to the parent function. Make sure to identify key points such as asymptotes and x-intercepts.

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

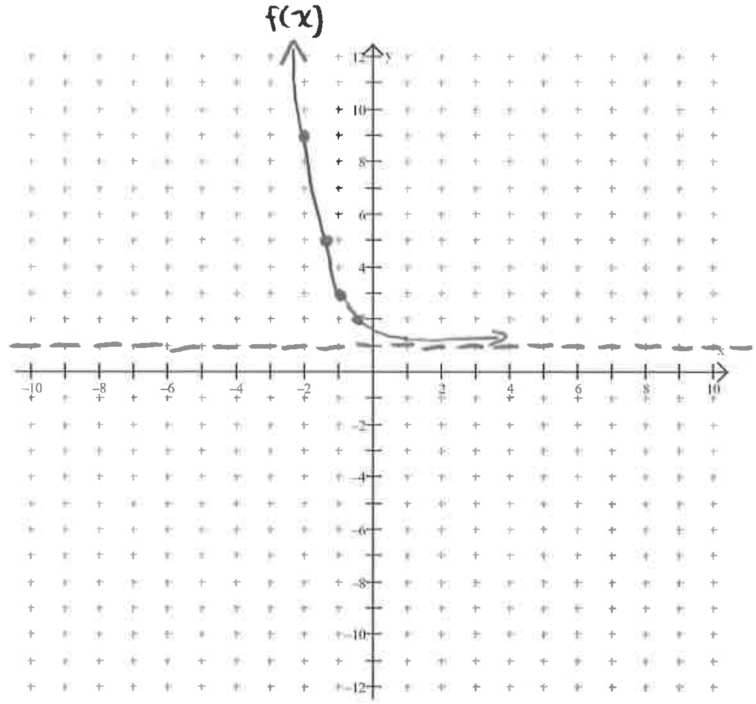
a) $f(x) = 2(2)^{-2x-2} + 1$

$y = 2^x$

x	y
-1	0.5
0	1
1	2
HA	y=0

$f(x)$

$\frac{x}{-2} - 1$	$2y+1$
-0.5	2
-1	3
-1.5	5
HA	y=1



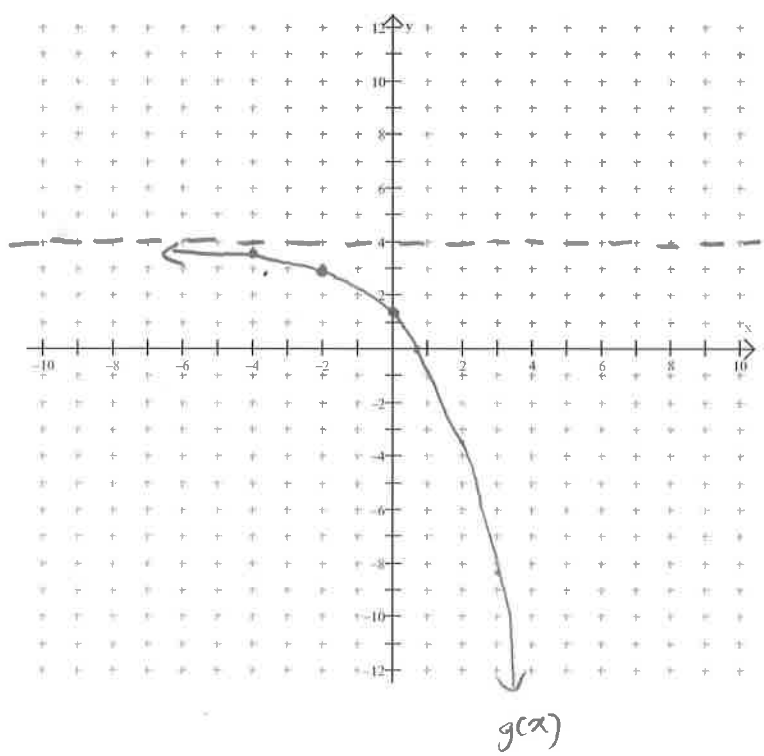
b) $g(x) = -(e)^{\frac{1}{2}(x+2)} + 4$

$y = e^x$

x	y
-1	0.37
0	1
1	2.72
HA	y=0

$g(x)$

$2x-2$	$-1y+4$
-4	3.63
-2	3
0	1.28
HA	y=4



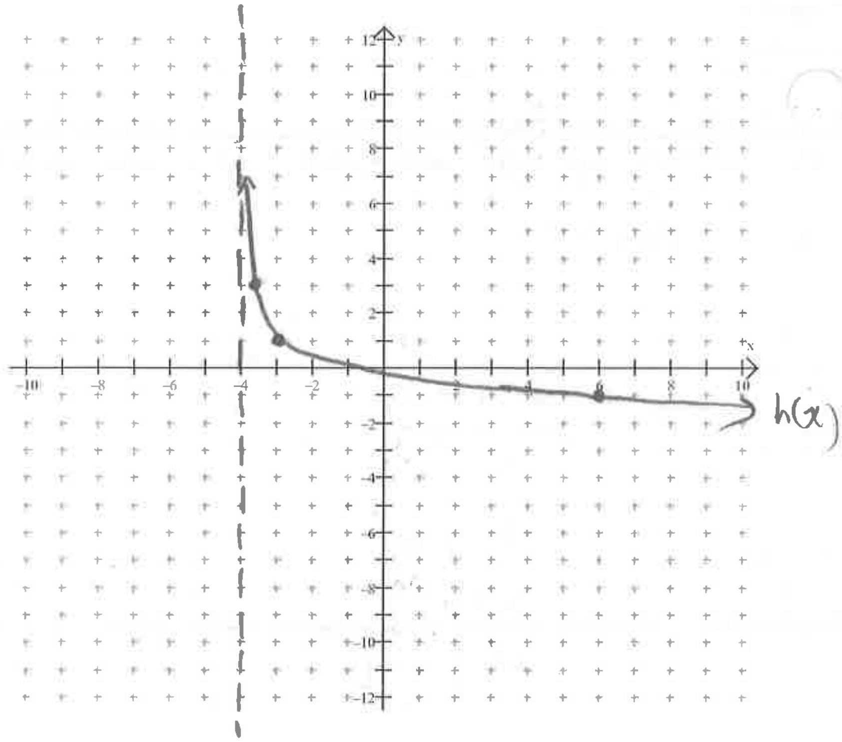
c) $h(x) = -2\log(x+4) + 1$

$y = \log x$

x	y
0.1	-1
1	0
10	1
VA	$x=0$

$h(x)$

$x-4$	$-2y+1$
-3.9	3
-3	1
6	-1
VA	$x=-4$



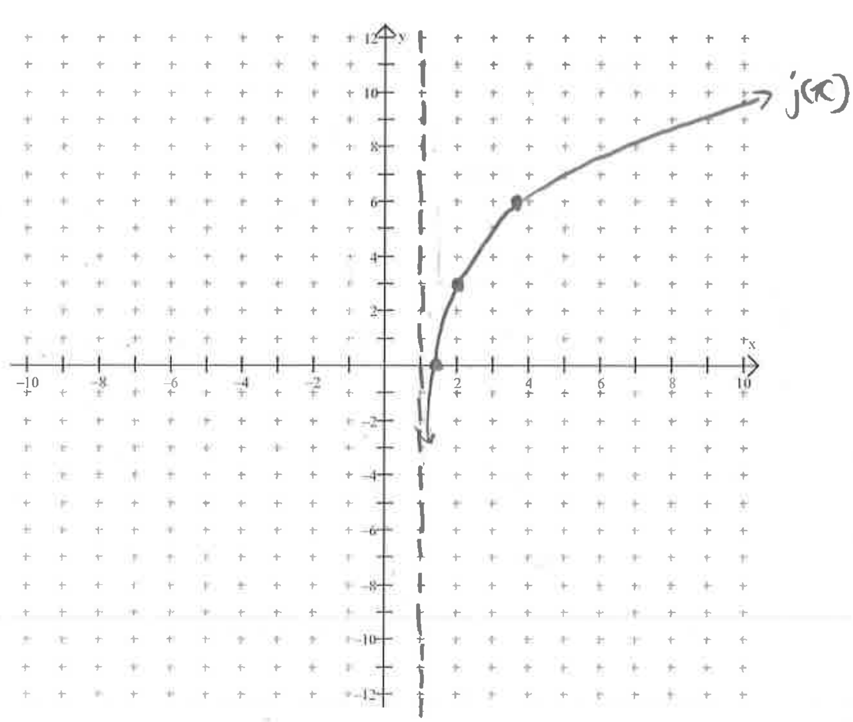
d) $j(x) = 3\ln(x-1) + 3$

$y = \ln x$

x	y
0.37	-1
1	0
2.72	1
VA	$x=0$

$j(x)$

$x+1$	$3y+3$
1.37	0
2	3
3.72	6
VA	$x=1$



2) Graph each of the following reciprocal functions. Start by graphing the function in the denominator. Show as much characteristic information about the graph as you can (e.g. intercepts, asymptotes with equations, other defining points, etc).

a) $f(x) = \frac{1}{x^2-4} = \frac{1}{(x-2)(x+2)}$

$y = x^2 - 4$

x-int: 2 and -2

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

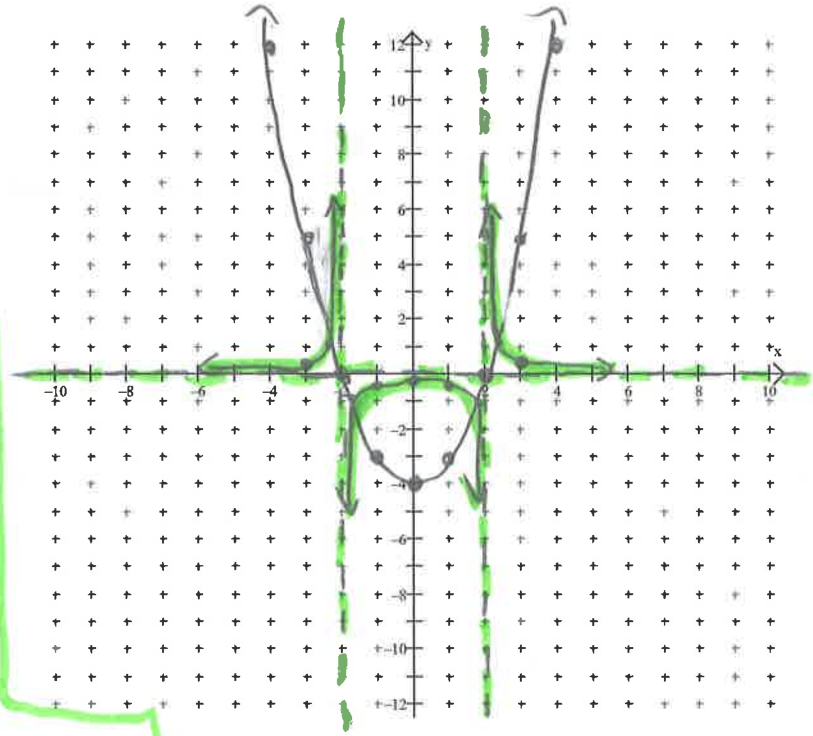
x	y
-3	5
-2	0
-1	-3
0	-4
1	-3
2	0
3	5

f(x)

x	$\frac{1}{y}$
-3	0.2
-2	und.
-1	-0.33
0	-0.25
1	-0.33
2	und.
3	0.2

HA: y=0

VA: x=2 and x=-2



$g(x) = \frac{2}{x+3}$

$y = x+3$

x-int: (-3,0)

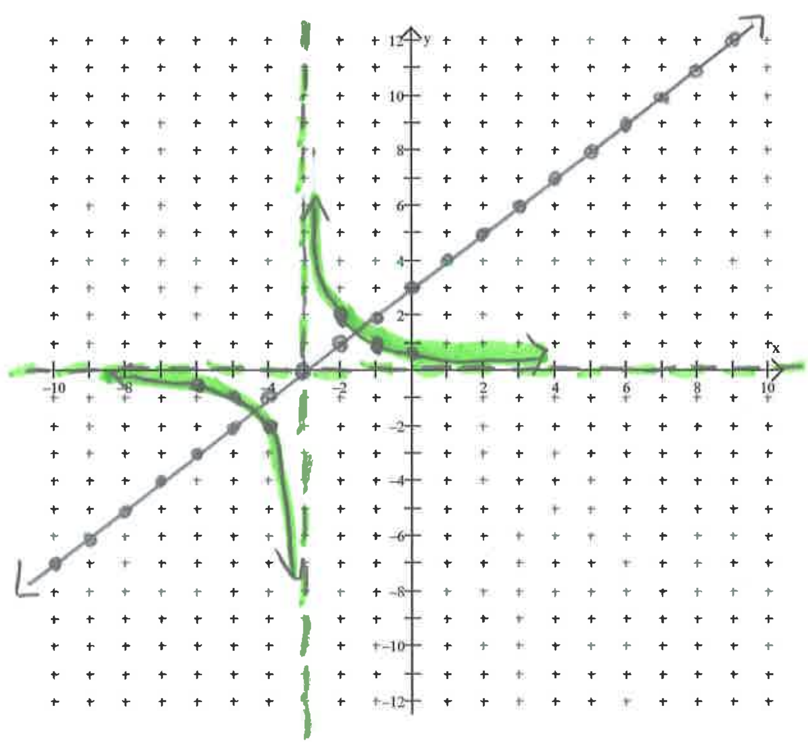
x	y
-6	-3
-5	-2
-4	-1
-3	0
-2	1
-1	2
0	3

g(x)

x	$\frac{2}{y}$
-6	-0.67
-5	-1
-4	-2
-3	und
-2	2
-1	1
0	0.67

HA: y=0

VA: x = -3



3) Graph each of the following functions. Make sure to identify key characteristics of the functions including intercepts and asymptotes.

a) $f(x) = \frac{x-3}{2x-1}$

VA: $x = \frac{1}{2}$

HA: $y = \frac{1}{2}$

x-int: $0 = x - 3$

$x = 3$

$(3, 0)$

y-int: $f(0) = \frac{0-3}{2(0)-1}$

$f(0) = 3$

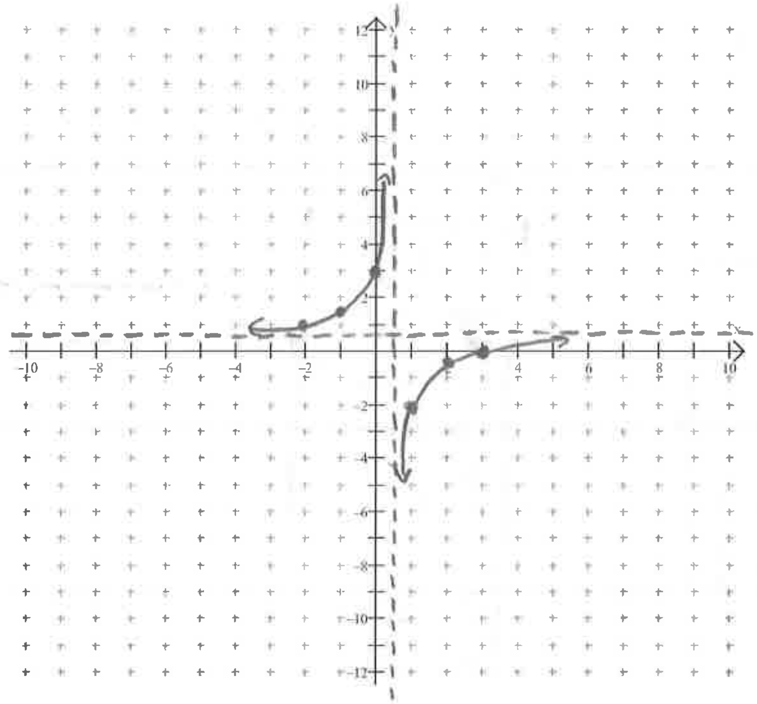
$(0, 3)$

Other Point:

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

$F(2) = -\frac{1}{3}$

$(2, -0.33)$



b) $g(x) = \frac{x+2}{x-1}$

VA: $x = 1$

HA: $y = \frac{1}{1} = 1$

x-Int: $0 = x + 2$

$x = -2$

$(-2, 0)$

y-int: $g(0) = \frac{0+2}{0-1}$

$g(0) = -2$

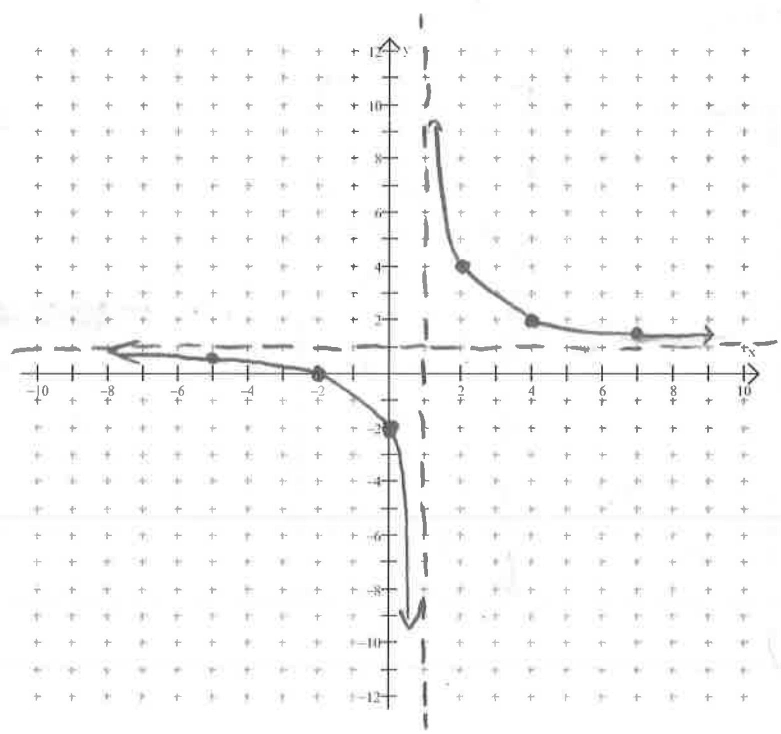
$(0, -2)$

Another Point:

$g(7) = \frac{7+2}{7-1}$

$g(7) = 1.5$

$(7, 1.5)$



4) Use a calculator to approximate each to the nearest thousandth

a) $\ln 7$

$\simeq 1.946$

b) $\ln e$

$= 1$

c) e^5

$\simeq 148.413$

5) Solve each equation. Round your answer to 4 decimal places if necessary.

a) $e^{3x} = 87$

$\ln(e)^{3x} = \ln 87$

$3x \ln(e) = \ln 87$

$3x(1) = \ln 87$

$3x = \ln 87$

$x = \frac{\ln 87}{3}$

$\boxed{x \simeq 1.4886}$

b) $2e^{3x+1} = 70$

$e^{3x+1} = 35$

$\ln(e)^{3x+1} = \ln 35$

$(3x+1)\ln e = \ln 35$

$(3x+1)(1) = \ln 35$

$x = \frac{\ln(35) - 1}{3}$

$\boxed{x \simeq 0.8518}$

c) $\ln(x + 1) = \ln(2x - 5)$

$x + 1 = 2x - 5$

$\boxed{6 = x}$

d) $5 \ln x + 2 \ln x - 3 = 12$

$5\ln x + 2\ln x = 15$

$7 \ln x = 15$

$\ln x = \frac{15}{7}$

$e^{15/7} = x$

$\boxed{x \simeq 8.5238}$

e) $\ln(3x) = 2$

$e^2 = 3x$

$x = \frac{e^2}{3}$

$\boxed{x \simeq 2.463}$

f) $1 - 2e^{2x} = -19$

$20 = 2e^{2x}$

$10 = e^{2x}$

$\ln(10) = 2x$

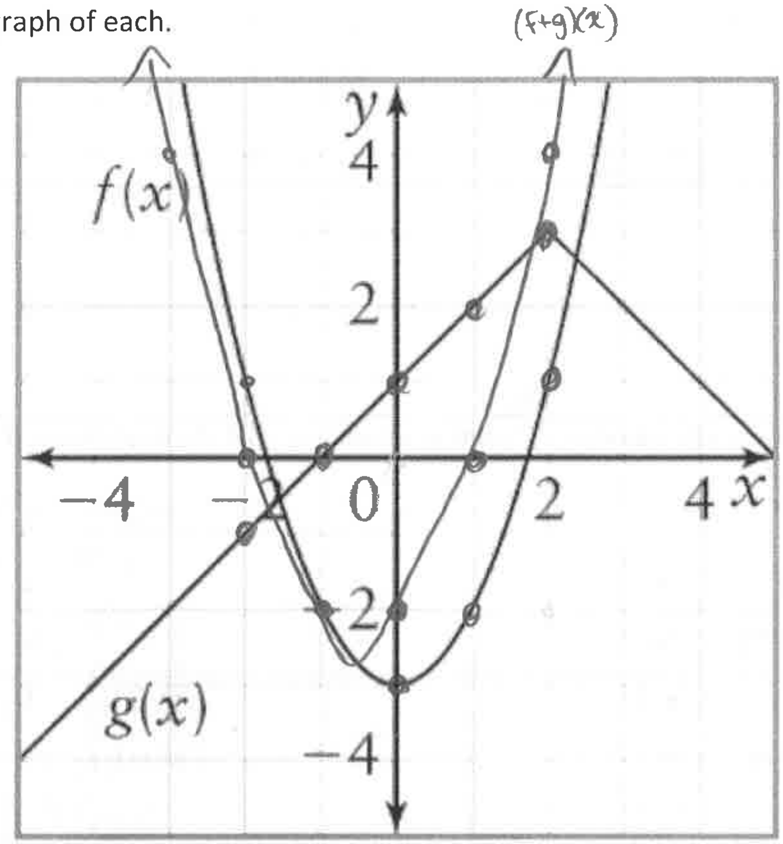
$x = \frac{\ln(10)}{2}$

$\boxed{x \simeq 1.1513}$

6) Use the superposition principal to draw a graph of each.

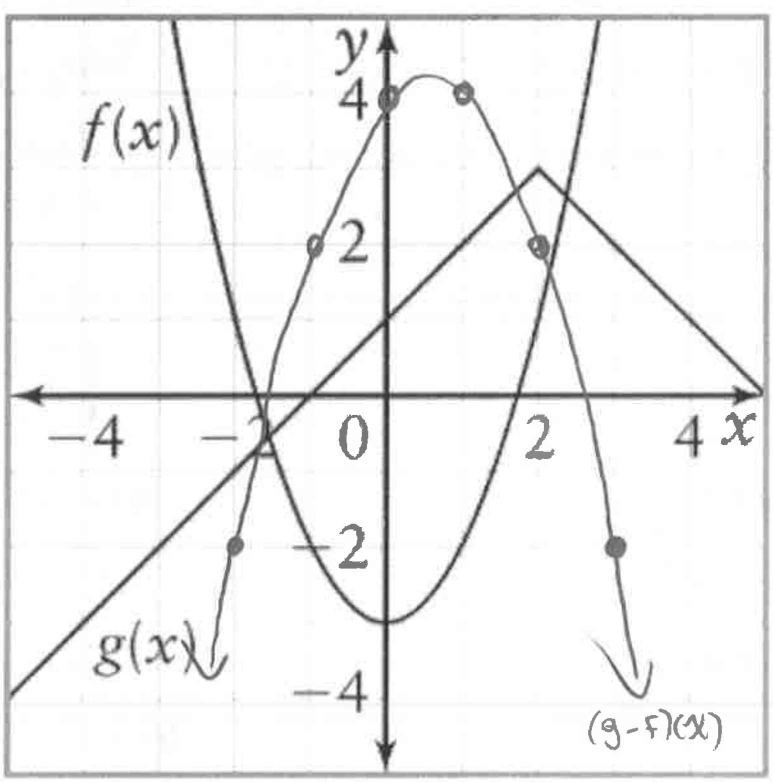
a) $y = f(x) + g(x)$

x	$f(x)$	$g(x)$	$(f+g)(x)$
-2	1	-1	0
-1	-2	0	-2
0	-3	1	-2
1	-2	2	0
2	1	3	4



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

x	$(g-f)(x)$
-2	-2
-1	2
0	4
1	4
2	2



7) Given that $f(x) = 2x + 3$ and $g(x) = x^2 + x$, and $h(x) = x^2 - 3$, develop an algebraic model for...

a) $y = f(x) - g(x)$

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

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

$\boxed{y = -x^2 + x + 3}$

b) $y = f(x) - g(x) + h(x)$

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

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

$\boxed{y = x}$

8) If $f(x) = 2x + 3$ and $g(x) = x^2 + x$, and $h(x) = x^2 - 3$, develop algebraic models for each.

a) $y = f(h(x))$

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

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

$\boxed{y = 2x^2 - 3}$

b) $y = g(f(x))$

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

$y = 4x^2 + 12x + 9 + 2x + 3$

$\boxed{y = 4x^2 + 14x + 12}$

c) $y = f(f^{-1}(x))$

$f^{-1}(x)$

$y = 2x+3$

$x = 2y+3$

$\frac{x-3}{2} = y$

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

$f(f^{-1}(x))$

$y = \cancel{2}\left(\frac{x-3}{\cancel{2}}\right) + 3$

$y = x - 3 + 3$

$\boxed{y = x}$