Operations on Functions Review
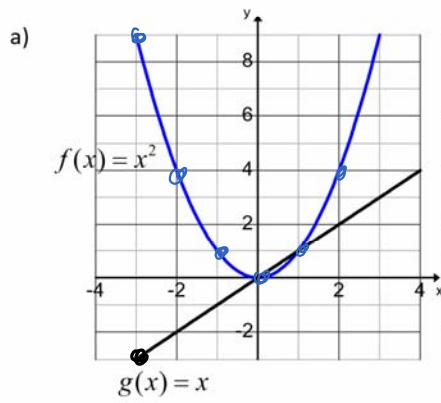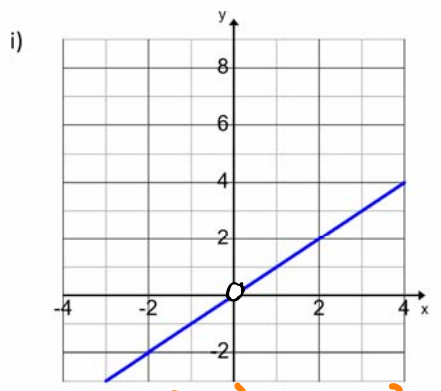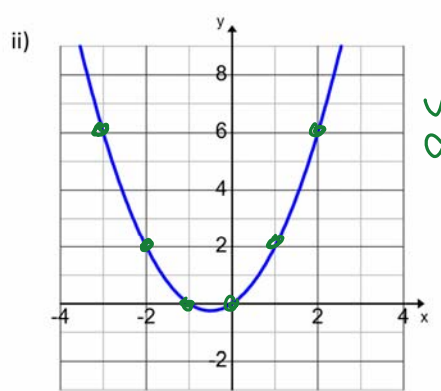
Operations on Functions Review:

1. Given $y = f(x)$ and $y = g(x)$, for each pair of graphs determine which graphs below represent $y = f(x) + g(x)$, $y = f(x) - g(x)$ $y = f(x)g(x)$ and $y = f(x)/g(x)$. Explain your reasoning.
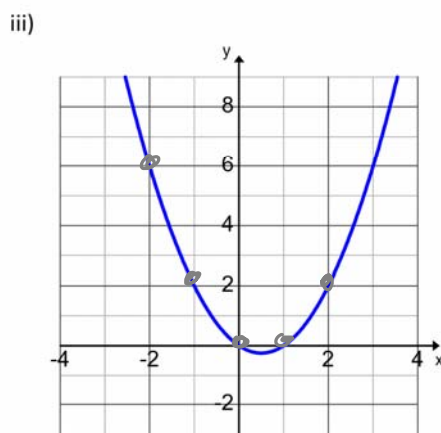
a)

$f(x) = x^2$

$g(x) = x$

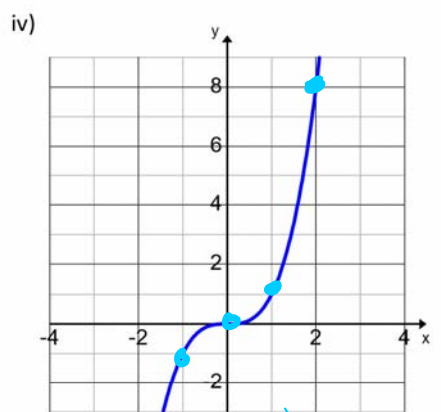| x	$f(x)$	$g(x)$	$(f+g)(x)$	$(f-g)(x)$	$(fg)(x)$	$\left(\dfrac{f}{g}\right)(x)$
-3	9	-3	6	12	-27	-3
-2	4	-2	2	6	-8	-2
-1	1	-1	0	2	-1	-1
0	0	0	0	0	0	undefined
1	1	1	2	0	1	1
2	4	2	6	2	8	2

i)

$y = \dfrac{f(x)}{g(x)} = \dfrac{x^2}{x} = x, \; x \neq 0$
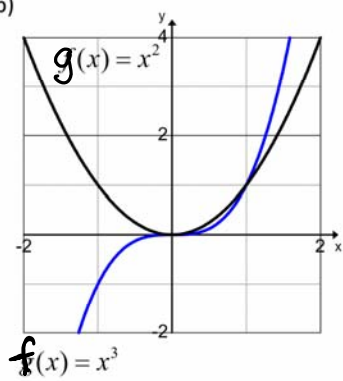
ii)

$y = f(x) + g(x)$
$= x^2 + x$
$= x(x+1)$

iii)

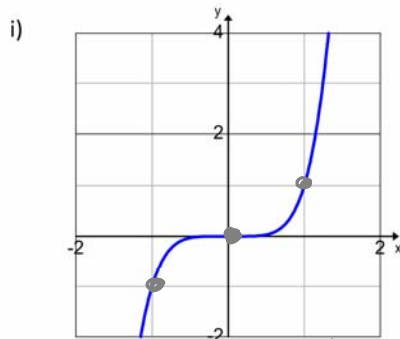$y = f(x) - g(x)$
$= x^2 - x$
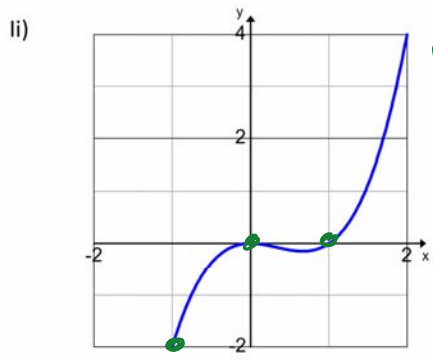$= x(x-1)$

iv)

$y = f(x)g(x)$
$= (x^2)(x)$
$= x^3$

b)

$g(x) = x^2$
$f(x) = x^3$

x	$f(x)$	$g(x)$	$(f+g)(x)$	$(f-g)(x)$	$(fg)(x)$	$\left(\dfrac{f}{g}\right)(x)$
-2		4				
-1	~1	1	0	-2	-1	-1
0	0	0	0	0	0	$\frac{0}{0}$ = undefined (hole)
1	1	1	2	0	1	1
2		4				

i)

$$y = f(x)g(x)$$
$$= x^3 \cdot x^2$$
$$= x^5$$

ii)

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

iii)

$$y = \frac{f(x)}{g(x)} = \frac{x^3}{x^2}, \; x, \; x \neq 0$$

iv)
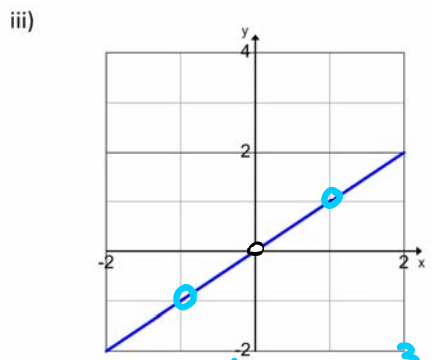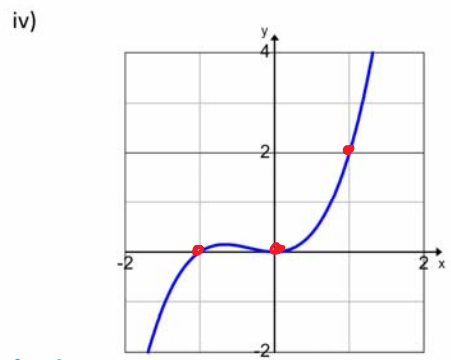
$$y = f(x) + g(x)$$
$$= x^3 + x^2$$
$$= x^2(x+1)$$

f,y

c)

$f(x) = (x-2)^2$

$g(x) = -2.5$
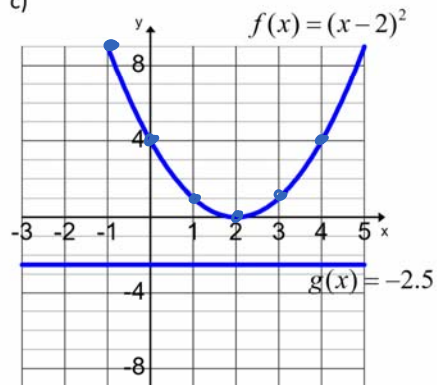
x	$f(x)$	$g(x)$	$(f+g)(x)$	$(f-g)(x)$	$(fg)(x)$	$\left(\dfrac{f}{g}\right)(x)$
-1	9	-2.5	6.5	11.5	-22.5	-3.6
0	4	-2.5	1.5	6.5	-10	-1.6
1	1	-2.5	-1.5	3.5	-2.5	-0.4
2	0	-2.5	-2.5	2.5	0	0
3	1	-2.5	-1.5	3.5	-2.5	-0.4
4	4	-2.5	1.5	6.5	-10	-1.6
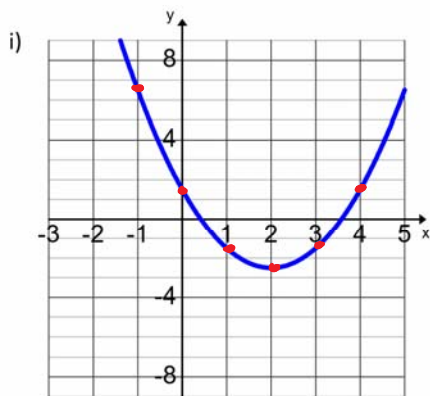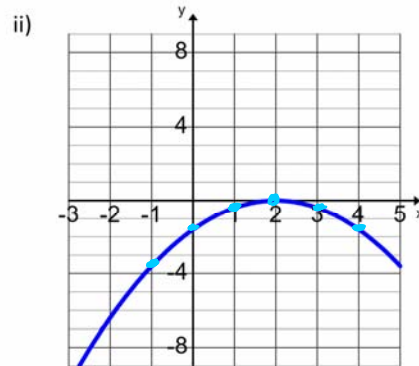
i)

$y = f(x) + g(x)$
$= (x-2)^2 + -2.5$
$= (x-2)^2 - 2.5$

ii)

$y = \dfrac{f(x)}{g(x)} = \dfrac{(x-2)^2}{-2.5}$

$= -0.4(x-2)^2$

iii)

$y = f(x)g(x)$
$= (x-2)^2(-2.5)$
$= -2.5(x-2)^2$

iv)

$y = f(x) - g(x)$
$= (x-2)^2 - -2.5$
$= (x-2)^2 + 2.5$

d)

$f(x) = x^3$

$g(x) = x+1$
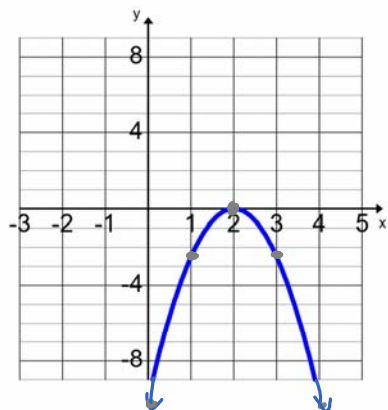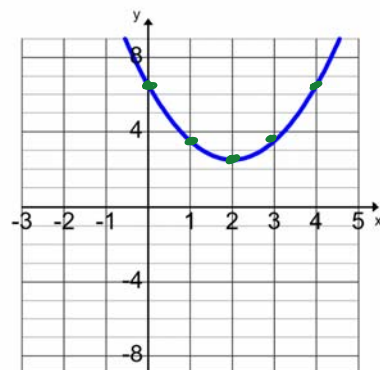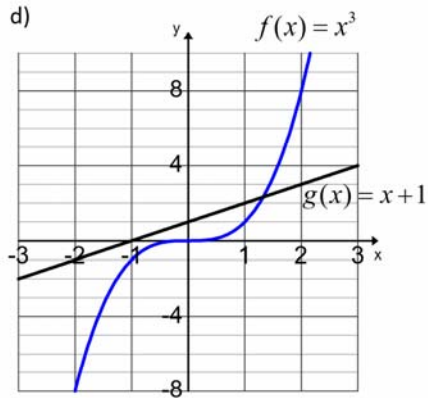
x	$f(x)$	$g(x)$	$(f+g)(x)$	$(f-g)(x)$	$(fg)(x)$	$\left(\dfrac{f}{g}\right)(x)$
-2	-8	-1	-9	-7	8	8
-1	-1	0	-1	-1	-1	$\frac{-1}{0}$=undefined ∴ VA
0	0	1	1	-1	0	0
1	1	2	3	-1	2	0.5
2	8	3	11	5	24	$2.\overline{6}$

i)

$y = f(x) + g(x)$
$= x^3 + x + 1$

ii)

$y = f(x)g(x)$
$= x^3(x+1)$
$= x^4 + x^3$

iii)

$y = \dfrac{f(x)}{g(x)} = \dfrac{x^3}{x+1}$, $x \neq -1$

iv)

$y = f(x) - g(x)$
$= x^3 - (x+1)$
$= x^3 - x - 1$