Key

Quadratics & Functions Review

For the table below one form of a quadratic equation is given. In the blank spaces, rewrite the given equation into the other forms.

	A	B	C
$y = ax^2 + bx + c$	$y=-2x^2-2x+24$	$y=-4x^2+16x-12$	$y=2x^2-12x+16$
$y = a(x-h)^2 + k$	$y=-2(x+\frac{1}{2})^2+\frac{49}{2}$	$y=-4(x-2)^2+4$	$y=2(x-3)^2-2$
$y = a(x-p)(x-q)$	$y = -2(x+4)(x-3)$	$y=-4(x-3)(x-1)$	$y=2(x-4)(x-2)$

For each of the quadratic functions above, find the y-intercept, zero(s), vertex, and the equation of the axis of symmetry.

A	B	C
y-int: $(0,24)$	$(0,-12)$	$(0,16)$
Zeros: $(-4,0)$ & $(3,0)$	$(3,0)$ & $(1,0)$	$(2,0)$ & $(4,0)$
vertex: $(\frac{-1}{2}, \frac{49}{2})$	$(2,4)$	$(3,-2)$
axis of symmetry: $x = \frac{-1}{2}$	$x=2$	$x=3$

For what value(s) of *k* will the function

a. $f(x) = 2x^2 + 12x + k$ have 2 distinct real roots? (Discriminant > 0)

$12^2-4(2)(k)>0$

$144-8k>0$

$-8k>-144$

$k<18$

b. $g(x) = 3x^2 + kx + 2k$ have 1 repeated solution? (Discriminant = 0)

$k^2-4(3)(2k)=0$

$k^2-24k=0$

$k(k-24)=0$

$k=0, 24$

(Set equations equal, move left, discriminant <0)

For what value(s) of k will the 2 functions, $f(x) = kx^2 + 7x + (k+3)$ and $g(x) = -5x + 3$ never intersect?

$kx^2 + 7x + k + 3 = -5x + 3$

$kx^2 + 12x + k = 0$

$12^2 - 4(k)(k) < 0$

$144 - 4k^2 < 0$

$(12 - 2k)(12 + 2k) < 0$

− + −

−6 6

So $\boxed{k < -6 \text{ or } k > 6}$

Find the domain and range of each of the following functions:

a. $y = -4(x+5)^2 + 2$

Domain: $\mathbb{R}$

Range: $y \leq 2$

b. $f(x)$ has domain: $x \in \mathbb{R}$ and range: $y \leq -3$. Find the domain and range of $f^{-1}(x)$.

Domain: $x \leq -3$

Range: $\mathbb{R}$

Let $f(x) = 4 - x^2$ and $g(x) = 2x - 1$. Find the following:

a. $(f \circ g)(x) = 4 - (2x-1)^2$

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

$= -4x^2 + 4x + 3$

c. $(g \circ g)(x) = 2(2x-1) - 1$

$= 4x - 2 - 1$

$= 4x - 3$

b. $(f \circ g^{-1})(x) = 4 - \left(\frac{x+1}{2}\right)^2$

$y = 2x - 1$

$x = 2y - 1$

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

$= 4 - \left(\frac{x^2 + 2x + 1}{4}\right)$

$= \frac{16}{4} - \left(\frac{x^2 + 2x + 1}{4}\right)$

$= \frac{-x^2 - 2x + 15}{4}$

d. $(g \circ f)^{-1}(x)$, for $x \leq 0$.

$g(f(x)) = 2(4 - x^2) - 1$

$g(f(x)) = -2x^2 + 7$

$y = -2x^2 + 7$

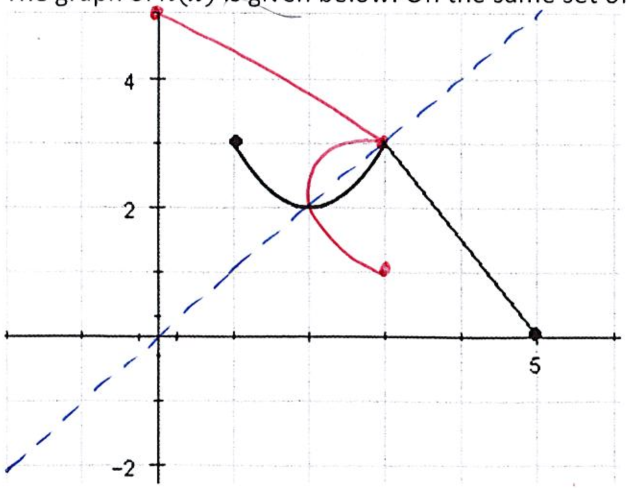
$x = -2y^2 + 7$

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

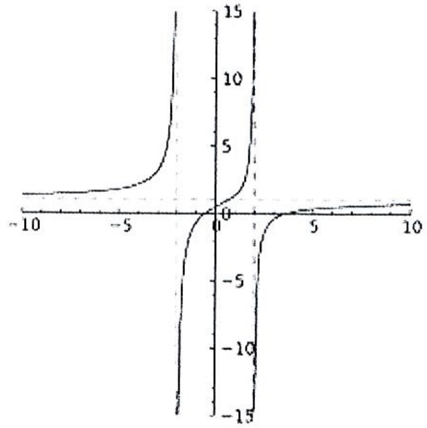
or

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

The graph of $h(x)$ is given below. On the same set of axes, draw $h^{-1}(x)$.



Let $g(x)$ represent the function whose graph is below. Find the equations of all asymptotes, the domain, the range, and a possible function.



HA: $y=1$ VA: $x=-2$, $x=2$

Domain: $\mathbb{R}$, except $x \neq -2, 2$

Range: $\mathbb{R}$

Many possible functions:

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

Find all asymptotes, holes, the domain, and the range of $f(x) = \frac{2x^3-2x}{2x^2-x-3}$.

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

HA: none

VA: $x = 3/2$

hole: $x=-1$

domain: $\mathbb{R}$, except $x \neq -1, 3/2$

Range: $\mathbb{R}$

Find all asymptotes, holes, the domain, and the range of $g(x) = \frac{1}{x+4}$.

HA: $y=0$

VA: $x=-4$

holes: none

domain: $\mathbb{R}$, except $x \neq -4$

range: $\mathbb{R}$, except $y \neq 0$.