Last day's work:

pp. 160-162 #1 – 5, 7, 9, 13 [17]

4d 13d

p.161 #4d)

4. Given $f(x) = 7 - 2(x-1)^2, x \geq 1$, determine **d)** $f^{-1}(2a+7)$

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

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

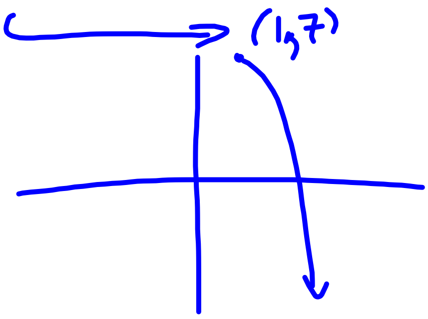
if $x = -2(y-1)^2 + 7$

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

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

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

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



So, if $f^{-1}(x) = 1 \pm \sqrt{\frac{x-7}{-2}}$

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

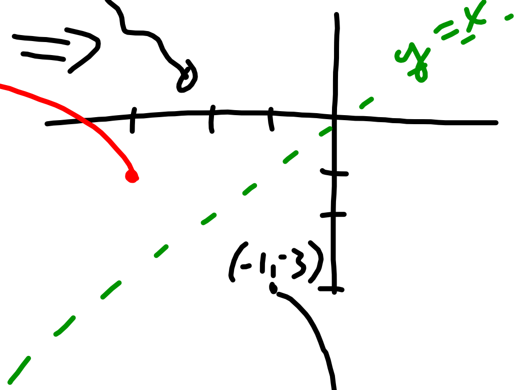
$= 1 \pm \sqrt{\frac{2a}{-2}}$

$= 1 \pm \sqrt{-a}$

p.161 #7

7. Given $f(x) = -(x+1)^2 - 3$ for $x \geq -1$, determine the equation for $f^{-1}(x)$. Graph the function and its inverse on the same axes.

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



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

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

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

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

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

Note:

$D = \{x \in \mathbb{R} \mid x \geq -1\}$

$R = \{y \in \mathbb{R} \mid y \leq -3\}$

$\therefore$ for f^{-1}

$D = \{x \in \mathbb{R} \mid x \leq -3\}$

$R = \{y \in \mathbb{R} \mid y \geq -1\}$

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

for $x \leq -3$

p.161 #9

9. For $-2 < x < 3$ and $f(x) = 3x^2 - 6x$, determine

a) the domain and range of $f(x)$

b) the equation of $f^{-1}(x)$ if $f(x)$ is further restricted to $1 < x < 3$ "open" circles

a) Domain is given:

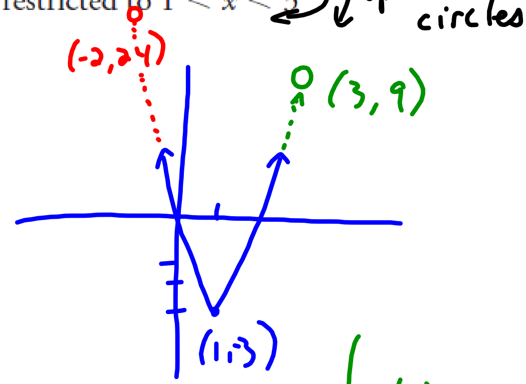
$\{x \in \mathbb{R} \mid -2 < x < 3\}$

Note: $f(x) = 3x^2 - 6x$

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

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

$\therefore V(1,-3)$

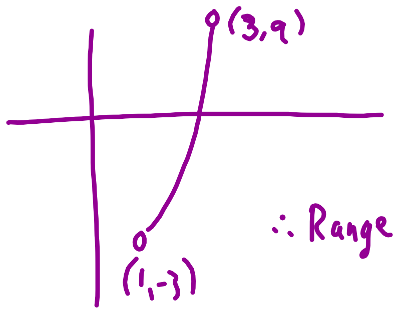


$f(-2) = 3(-2)^2 - 6(-2)$
$= 24$

$f(3)$
$= 3(3)^2 - 6(3)$
$= 9$

$\therefore$ Range: $\{y \in \mathbb{R} \mid -3 \le y < 24\}$

b) if $f(x)$, $1 < x < 3$



$\therefore$ Range: $\{y \in \mathbb{R} \mid -3 < y < 9\}$

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

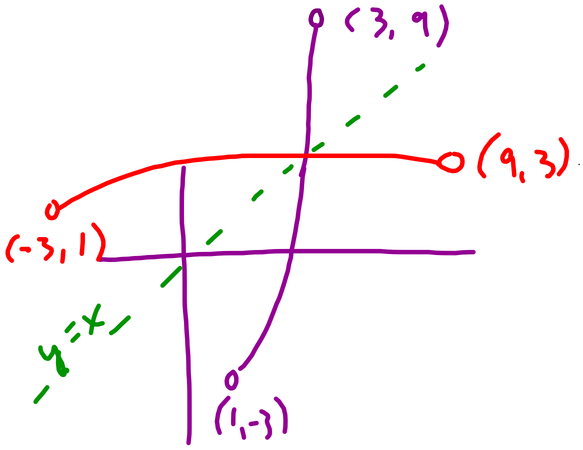
$x = 3(y-1)^2 - 3$

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

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

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

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

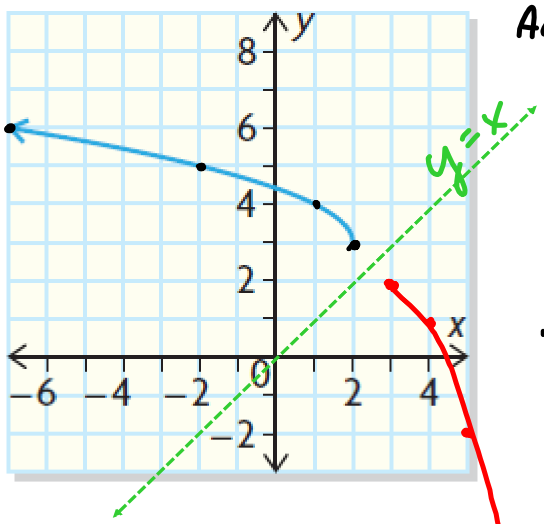


or $f^{-1}(x) = +\sqrt{\frac{1}{3}(x+9)} + 1$, where $-3 < x < 9$

p.162 #13d)

13. Each graph shows a function f that is a parabola or a branch of a parabola.

d)



Added key points in black

$\therefore$ no stretches or compressions

reflection in y-axis

translation 2 right + 3 up

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

i) Determine $f(x)$.

ii) Graph f^{-1}.

iii) State restrictions on the domain or range of f to make its inverse a function.

iv) Determine the equation(s) for f^{-1}.

(iii) No restrictions are necessary to make f^{-1} a function.

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

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

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

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

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

$y = -(x-3)^2 + 2$, but only for $x \geq 3$.