Additional Problems

④ Graph

a) $y = \sqrt{4x}$

Divide x by 4
⟶
Horizontal Compression

$y = \sqrt{x}$ $y = \sqrt{4x}$

b) $y = \sqrt{x+1} + 1$

Shift left by 1
and up by 1
⟶

$y = \sqrt{x}$
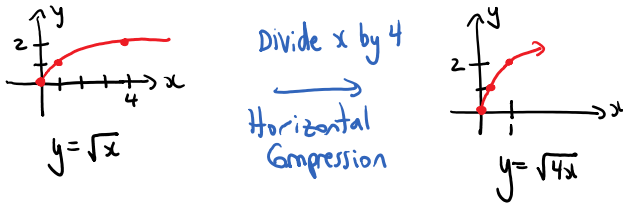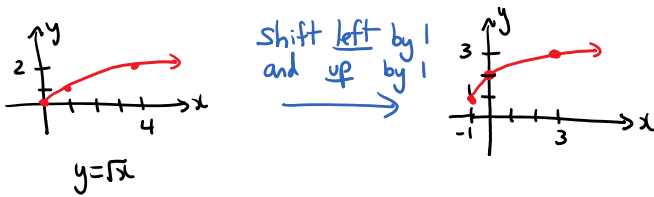
⑤ Solve $x^3 - 7x - 6 = 0$
using the Rational Roots Theorem

Any rational roots look like $\frac{p}{q}$

p: divides -6 p: $\pm 1, \pm 2, \pm 3, \pm 6$
q: divides 1 q: ± 1

$\frac{p}{q}$: $\pm 1, \pm 2, \pm 3, \pm 6$ are the possible roots

Fast Way:

Check $x = 1$: $1^3 - 7 - 6 \neq 0$

   $x = -1$: $(-1)^3 + 7 - 6 = 0$ ✓ $\boxed{x = -1}$

   $x = 2$: $8 - 14 - 6 \neq 0$

   $x = -2$: $(-2)^3 - 7(-2) - 6 = 0$ ✓ $\boxed{x = -2}$

   $x = 3$: $3^3 - 7(3) - 6 = 0$ ✓ $\boxed{x = 3}$

A 3rd-degree equation only has 3 solutions (so we're done)

Long Way: (if solutions are repeated e.g. $(x+1)^2(x-2) = 0$ has $x = -1, 2$)

Find one solution, say $x = -1$

So $x+1$ is a factor of $x^3 - 7x - 6$

The divide $x^3 - 7x - 6$ by $x+1$ to find other factors

⟶ Fast Way is ok for the exam.

⑥　$f(x) = x^3 + 4$ 　　　　$g(x) = \dfrac{x+1}{x+2}$

Find :

a)　$(g \circ f)(x) = g(f(x))$

$$= g(x^3 + 4)$$

$$= \frac{x^3 + 4 + 1}{x^3 + 4 + 2}$$

$$= \frac{x^3 + 5}{x^3 + 6}$$

b)　$g^{-1}(x)$

g : 　　　$y = \dfrac{x+1}{x+2}$

g^{-1}: 　　Swap x and y

$$x = \frac{y+1}{y+2}$$

Solve for y

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

$$xy + 2x = y+1$$

$$xy - y = 1 - 2x$$

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

$$y = \frac{1-2x}{x-1}$$

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

or　$g^{-1}(x) = \dfrac{-(2x-1)}{x-1} \quad \checkmark$

⑦ Solve $\log_5 (x+3) - \log_5 x = 3$

Log Rules $\quad \log_5 M - \log_5 N = \log_5 \frac{M}{N}$

$$\log_5 \left(\frac{x+3}{x}\right) = 3$$

$$5^3 = \frac{x+3}{x}$$

$$125 = \frac{x+3}{x}$$

$$125x = x+3$$

$$124x = 3$$

$$x = \frac{3}{124}$$

Check: Numbers going into a logarithm
should be > 0

✓