Serial # _____ ID _____ NAME _____
Show all necessary steps for full marks.

Q1. (5 points) (4.1 Example 6, page 390):

The rational function $f(x)=\dfrac{2x+3}{x-4},\ x\neq 4$ is one-to-one function. **Find its inverse.**

Solution:

$$y=\frac{2x+3}{x-4},\ x\neq 4$$
$$x=\frac{2y+3}{y-4},\ y\neq 4$$
$$xy-4x=2y+3,\ y\neq 4$$
$$xy-2y=4x+3,\ y\neq 4$$
$y(x-2)=4x+3$ Divide by $x-2$ with assumption that $x\neq 2$
$$y=\frac{4x+3}{x-2}$$
$$f^{-1}(x)=\frac{4x+3}{x-2},\ x\neq 2,\ y\neq 4$$

Q2. (5 points) (4.1 Classroom Example 7):

$f(x)=-\sqrt{x-2}, x\geq 2,$ then $f^{-1}(-2)+\left(f^{-1}\circ f\right)(4)=?$

Solution:

$\left(f^{-1}\circ f\right)(4)=4$

Let $f^{-1}(-2)=a$. Then $f\left(f^{-1}(-2)\right)=f(a)$

$\Rightarrow\ -2=f(a)$

$\Rightarrow\ -2=-\sqrt{a-2}$

$\Rightarrow\ 4=a-2\ \Rightarrow\ a=6$

$\Rightarrow\ f^{-1}(-2)=a=6$

$f^{-1}(-2)+\left(f^{-1}\circ f\right)(4)=6+4=10$

Q3. (5 points) (4.2 Exercise 51, page 409): Given the function $f(x)=\left(\dfrac{1}{3}\right)^{x+2}-1$

(a): Find the *x*-intercept
(b): Find the *y*-intercept
(c): Find the domain
(d): Sketch the graph $f(x)=\left(\dfrac{1}{3}\right)^{x+2}-1$
(e): Sketch the graph $g(x)=\left|\left(\dfrac{1}{3}\right)^{x+2}-1\right|$

Solution: (a): To find *x*-intercept, put $y=0$ and solve for *x*:

$$0=\left(\frac{1}{3}\right)^{x+2}-1\ \Rightarrow\ 1=\left(\frac{1}{3}\right)^{x+2}\ \Rightarrow\ x+2=0\ \Rightarrow\ \boxed{x=-2}$$

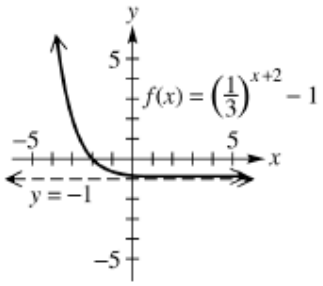
(b): To find y-intercept, put $x = 0$:

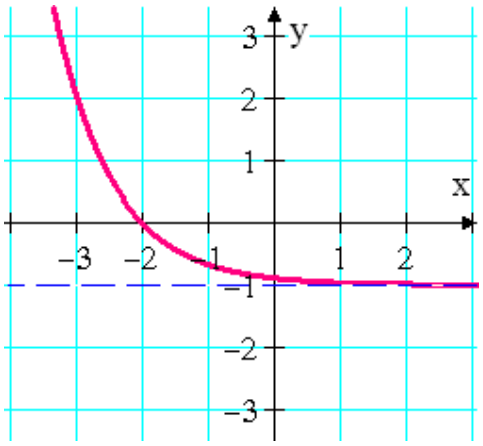
$$y = f(0) = \left(\frac{1}{3}\right)^{0+2} - 1 = \frac{1}{9} - 1 = -\frac{8}{9} \Rightarrow \boxed{y = -\frac{8}{9}}$$

(c): $D_f = (-\infty, \infty)$

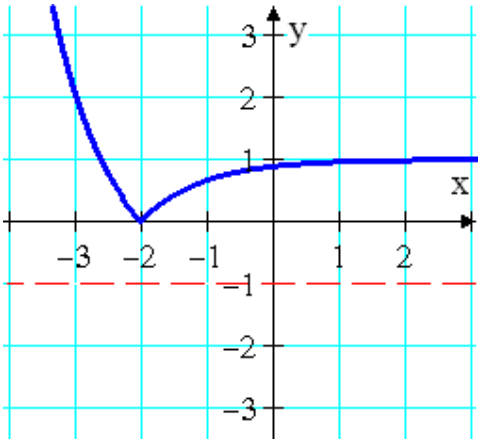
(d): $f(x) = \left(\frac{1}{3}\right)^{x+2} - 1$

51. The graph of $f(x) = \left(\frac{1}{3}\right)^{x+2} - 1$ is obtained by translating the graph of $f(x) = \left(\frac{1}{3}\right)^{x}$ two units to the left and one unit down.





(e): $g(x) = \left|\left(\frac{1}{3}\right)^{x+2} - 1\right|$



Q4. (5 points) (4.2 Exercise 70, page 410): Solve $(32)^{2x} = 16^{x-1}$

Solution:

70. $32^{2x} = 16^{x-1} \Rightarrow \left(2^5\right)^{2x} = \left(2^4\right)^{x-1} \Rightarrow$

$2^{10x} = 2^{4(x-1)} \Rightarrow 2^{10x} = 2^{4x-4} \Rightarrow$

$10x = 4x - 4 \Rightarrow 6x = -4 \Rightarrow x = -\frac{2}{3}$

Solution set: $\left\{-\frac{2}{3}\right\}$