

10.3

$$\begin{aligned}
 1) \quad g(x) &= -x^5 - 3 \\
 f(x) &= \sqrt[5]{-x-3} \\
 (g \circ f)(x) &= g(f(x)) \\
 g(\sqrt[5]{-x-3}) &= -(\sqrt[5]{-x-3})^5 - 3 \\
 &= -(-x-3) - 3 \\
 &= x + 3 - 3 \\
 &= x
 \end{aligned}$$

yes

$$\begin{aligned}
 3) \quad f(x) &= \frac{-x-1}{x-2} \\
 g(x) &= \frac{-2x+1}{-x-1} \\
 (f \circ g)(x) &= f(g(x)) \\
 f\left(\frac{-2x+1}{-x-1}\right) &= \frac{-\left(\frac{-2x+1}{-x-1}\right)-1}{\frac{-2x+1}{-x-1}-2} \\
 &= \frac{\left(\frac{-x-1}{-x-1}\right)\frac{2x-1}{-x-1}-1(-x-1)}{\left(\frac{-x-1}{-x-1}\right)\frac{-2x+1}{-x-1}-2(-x-1)} \\
 &= \frac{2x-1+x+1}{-2x+1+2x+2} \\
 &= \frac{3x}{3} = x
 \end{aligned}$$

yes

$$\begin{aligned}
 5) \quad g(x) &= -10x + 5 \\
 f(x) &= \frac{x-5}{10} \\
 (g \circ f)(x) &= g(f(x)) \\
 g\left(\frac{x-5}{10}\right) &= -10\left(\frac{x-5}{10}\right) + 5 \\
 &= -x + 5 + 5 \\
 &= -x + 10
 \end{aligned}$$

No

$$\begin{aligned}
 7) \quad f(x) &= -\frac{2}{x+3} \\
 g(x) &= \frac{3x+2}{x+2} \\
 (f \circ g)(x) &= f(g(x)) \\
 f\left(\frac{3x+2}{x+2}\right) &= \frac{-2(x+2)}{(x+2)\frac{3x+2}{x+2}+3(x+2)} \\
 &= \frac{-2x-4}{3x+2+3x+6} \\
 &= \frac{-2x-4}{6x+12} = \frac{-2(x+2)}{6(x+2)} = -\frac{2}{6} = -\frac{1}{3}
 \end{aligned}$$

No

$$\begin{aligned}
 9) \quad g(x) &= \sqrt[5]{\frac{x-1}{2}} \\
 f(x) &= 2x^5 + 1 \\
 (g \circ f)(x) &= g(f(x)) \\
 g(2x^5 + 1) &= \sqrt[5]{\frac{2x^5+1-1}{2}} \\
 &= \sqrt[5]{\frac{2x^5}{2}} \\
 &= \sqrt[5]{x^5} \\
 &= x
 \end{aligned}$$

yes

$$\begin{aligned}
 11) \quad f(x) &= (x-2)^5 + 3 \\
 y &= (x-2)^5 + 3 \\
 x &= (y-2)^5 + 3 \\
 -3 & \quad -3 \\
 \sqrt[5]{x-3} &= \sqrt[5]{y-2} \\
 \sqrt[5]{x-3} &= y-2 \\
 \frac{\quad +2 \quad +2}{\sqrt[5]{x-3} + 2} &= y \\
 f^{-1}(x) &= \sqrt[5]{x-3} + 2
 \end{aligned}$$

$$\begin{aligned}
 13) \quad g(x) &= \frac{4}{x+2} \\
 y &= \frac{4}{x+2} \\
 x &= \frac{4}{y+2} \\
 (y+2)x &= \frac{4}{y+2}(y+2) \\
 \frac{x(y+2)}{x} &= \frac{4}{x} \\
 y+2 &= \frac{4}{x} \\
 \frac{\quad -2 \quad -2}{y} &= 4x - 2 \\
 g^{-1}(x) &= \frac{4}{x} - 2
 \end{aligned}$$

$$\begin{aligned}
 15) f(x) &= \frac{-2x-2}{x+2} \\
 y &= \frac{-2x-2}{x+2} \\
 x &= \frac{-2y-2}{y+2} \\
 (y+2)x &= \frac{-2y-2}{y+2} (y+2) \\
 xy + 2x &= -2y - 2 \\
 +2y - 2x + 2y - 2x & \\
 xy + 2y &= -2 - 2x \\
 \frac{y(x+2)}{x+2} &= \frac{-2-2x}{x+2} \\
 y &= \frac{-2-2x}{x+2} \\
 f^{-1}(x) &= \frac{-2-2x}{x+2}
 \end{aligned}$$

$$\begin{aligned}
 17) f(x) &= \frac{10-x}{5} \\
 y &= \frac{10-x}{5} \\
 5(x) &= \frac{10-y}{5} (5) \\
 5x &= 10 - y \\
 -10 - 10 & \\
 \frac{5x - 10}{-1} &= \frac{-y}{-1} \\
 -5x + 10 &= y \\
 f^{-1}(x) &= -5x + 10
 \end{aligned}$$

$$\begin{aligned}
 19) g(x) &= -(x-1)^3 \\
 y &= -(x-1)^3 \\
 \frac{x}{-1} &= \frac{-(y-1)^3}{-1} \\
 \sqrt[3]{-x} &= \sqrt[3]{(y-1)^3} \\
 \sqrt[3]{-x} &= y-1 \\
 +1 \quad +1 & \\
 \sqrt[3]{-x} + 1 &= y \\
 g^{-1}(x) &= \sqrt[3]{-x} + 1
 \end{aligned}$$

$$\begin{aligned}
 21) f(x) &= (x-3)^3 \\
 y &= (x-3)^3 \\
 \sqrt[3]{x} &= \sqrt[3]{(y-3)^3} \\
 \sqrt[3]{x} &= y-3 \\
 +3 \quad +3 & \\
 \sqrt[3]{x} + 3 &= y \\
 f^{-1}(x) &= \sqrt[3]{x} + 3
 \end{aligned}$$

$$\begin{aligned}
 23) g(x) &= \frac{x}{x-1} \\
 y &= \frac{x}{x-1} \\
 (y-1)x &= \frac{y}{y-1} (y-1) \\
 xy - x &= y \\
 \frac{-xy}{-x} &= \frac{-xy}{-x} \\
 -x &= y - xy \\
 -\frac{x}{1-x} &= \frac{y(1-x)}{1-x} \\
 -\frac{x}{1-x} &= y \\
 g^{-1}(x) &= -\frac{x}{1-x}
 \end{aligned}$$

$$\begin{aligned}
 25) f(x) &= \frac{x-1}{x+1} \\
 y &= \frac{x-1}{x+1} \\
 (y+1)x &= \frac{y-1}{y+1} (y+1) \\
 xy + x &= y - 1 \\
 \frac{-y-x}{xy-y} &= \frac{-y-x}{-y-x} \\
 \frac{y(x-1)}{x-1} &= \frac{-1-x}{x-1} \\
 y &= \frac{-1-x}{x-1} \\
 f^{-1}(x) &= \frac{-1-x}{x-1}
 \end{aligned}$$

$$\begin{aligned}
 27) g(x) &= \frac{8-5x}{4} \\
 y &= \frac{8-5x}{4} \\
 4(x) &= \frac{8-5y}{4} (4) \\
 4x &= 8 - 5y \\
 \frac{-8-8}{4x-8} &= \frac{-5y}{-5} \\
 \frac{4x-8}{-5} &= y \\
 g^{-1}(x) &= \frac{4x-8}{-5}
 \end{aligned}$$

$$29) g(x) = -5x + 1$$

$$y = -5x + 1$$

$$x = -5y + 1$$

$$\frac{-1}{-5} = \frac{-1}{-5}$$

$$\frac{x-1}{-5} = -\frac{5y}{-5}$$

$$\frac{x-1}{-5} = y$$

$$g^{-1}(x) = \frac{x-1}{-5}$$

$$31) g(x) = -1 + x^3$$

$$y = -1 + x^3$$

$$x = -1 + y^3$$

$$\frac{+1}{+1} = \frac{+1}{+1}$$

$$\sqrt[3]{x+1} = \sqrt[3]{y^3}$$

$$y = \sqrt[3]{x+1}$$

$$g^{-1}(x) = \sqrt[3]{x+1}$$

$$33) h(x) = \frac{4 - \sqrt[3]{4x}}{2}$$

$$y = \frac{4 - \sqrt[3]{4x}}{2}$$

$$(2)x = \frac{4 - \sqrt[3]{4y}}{2} (2)$$

$$2x = 4 - \sqrt[3]{4y}$$

$$\frac{-4}{-1} = \frac{-4}{-1}$$

$$\frac{2x-4}{-1} = \frac{-\sqrt[3]{4y}}{-1}$$

$$(-2x+4)^3 = (\sqrt[3]{4y})^3$$

$$\frac{(-2x+4)^3}{4} = \frac{4y}{4}$$

$$\frac{(-2x+4)^3}{4} = y$$

$$h^{-1}(x) = \frac{(-2x+4)^3}{4}$$

$$35) f(x) = \frac{x+1}{x+2}$$

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

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

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

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

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

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

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

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

$$37) f(x) = \frac{7-3x}{x-2}$$

$$y = \frac{7-3x}{x-2}$$

$$(y-2)x = \frac{7-3y}{y-2}(y-2)$$

$$xy - 2x = 7 - 3y$$

$$\frac{+3y+2x}{+3y+2x} = \frac{+3y+2x}{+3y+2x}$$

$$xy + 3y = 7 + 2x$$

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

$$y = \frac{y+2x}{x+3}$$

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

$$39) g(x) = -x$$

$$y = -x$$

$$\frac{x}{-1} = (-y)/-1$$

$$-x = y$$

$$g^{-1}(x) = -x$$