Honors PreCalc 1.4

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#37, 40

(5) $f(x) = \sqrt{x+3}$ D: $[-3, \infty)$
$g(x) = x^2$ D: $(-\infty, \infty)$

$f/g \rightarrow \frac{\sqrt{x+3}}{x^2}$ D: $[-3, 0) \cup (0, \infty)$

$g/f \rightarrow \frac{x^2}{\sqrt{x+3}}$ D: $(-3, \infty)$

(12) $f(x) = x^2 - 1$
$g(x) = 2x - 3$

$(f \circ g)(3) \Rightarrow g(3) = -3$
$f(-3) = 8$

$(g \circ f)(-2) \Rightarrow f(-2) = 3$
$g(3) = 3$

(14) $f(x) = \frac{x}{x+1}$ $g(x) = 9 - x^2$

$(f \circ g)(3) \Rightarrow g(3) = 0$
$f(0) = 0$

$(g \circ f)(-2) \Rightarrow f(-2) = 2$
$g(2) = 5$

(15) $f(x) = 3x + 2$
$g(x) = x - 1$

$f(g(x)) = 3(x-1) + 2$
$= 3x - 3 + 2$
$= 3x - 1$ D: $(-\infty, \infty)$

$g(f(x)) = 3x + 2 - 1$
$= 3x + 1$
D: $(-\infty, \infty)$

(16) $f(x) = x^2 - 1$

$g(x) = \dfrac{1}{x-1}$

$f(g(x)) = \left(\dfrac{1}{x-1}\right)^2 - 1 \Rightarrow \dfrac{1}{(x-1)^2} - 1$

D: $(-\infty, 1) \cup (1, \infty)$

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

D: $(-\infty, -\sqrt{2}) \cup (-\sqrt{2}, \sqrt{2}) \cup (\sqrt{2}, \infty)$

(17) $f(x) = x^2 - 2$

$g(x) = \sqrt{x+1}$

$f(g(x)) = \sqrt{x+1}^2 - 2 = x + 1 - 2 = x - 1$ D: $[-1, \infty)$

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

✓ | x | ✓

-1 $\quad$ 1

D: $(-\infty, -1] \cup [1, \infty)$

(18) $f(x) = \dfrac{1}{x-1}$

$g(x) = \sqrt{x}$

$f(g(x)) = \dfrac{1}{\sqrt{x} - 1}$ $\quad x \neq 1$ $\quad x \geq 0$

D: $[0, 1) \cup (1, \infty)$

$g(f(x)) = \sqrt{\dfrac{1}{x-1}} = \dfrac{1}{\sqrt{x-1}}$

$x \neq 1$ $\quad x - 1 \geq 0$ $\quad x > 1$

D: $(1, \infty)$

(19) $f(x) = x^2$

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

$f(g(x)) = \left(\sqrt{1-x^2}\right)^2 = 1-x^2$ D: $[-1,1]$

$g(f(x)) = \sqrt{1-(x^2)^2} = \sqrt{1-x^4}$ D: $[-1,1]$

(20) $f(x) = x^3$

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

$f(g(x)) = \left(\sqrt[3]{1-x^3}\right)^3 = 1-x^3$ D: $(-\infty,\infty)$

$g(f(x)) = \sqrt[3]{1-(x^3)^3} = \sqrt[3]{1-x^9}$ D: $(-\infty,\infty)$

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

$g(x) = \frac{1}{3x}$

$f(g(x)) = \frac{1}{2\left(\frac{1}{3x}\right)} = \frac{1}{\frac{2}{3x}} = \frac{3x}{2}$ D: $(-\infty,0)\cup(0,\infty)$

$g(f(x)) = \frac{1}{3\left(\frac{1}{2x}\right)} = \frac{1}{\frac{3}{2x}} = \frac{2x}{3}$ D: $(-\infty,0)\cup(0,\infty)$

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

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

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

$x \neq 1$
$x = 0$

D: $(-\infty, 0) \cup (0, 1) \cup (1, \infty)$

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

$x \neq 0$ $x \neq -1$

D: $(-\infty, -1) \cup (-1, 0) \cup (0, \infty)$

(37) $x^2 + y^2 = 25$

$y^2 = 25 - x^2$

$y = \pm\sqrt{25 - x^2}$

$y = \sqrt{25-x^2}$

$y = -\sqrt{25-x^2}$

(40) $3x^2 - y^2 = 25$

$\sqrt{3x^2 - 25} = \sqrt{y^2}$

$y = \sqrt{3x^2-25}$

$y = -\sqrt{3x^2-25}$