Name KEY

Review - Function Basics

***This is only a few extra problems of practice. Look back over the quiz, your notes, and other areas of general interest to prepare for this test!**

Find the domain of each. FAQ: Will these be on the test? A: Assume anything you see here will be on the test!

1) $f(x) = \dfrac{x^2 - 2x - 8}{\sqrt{9x + 20}}$ → D: $(-\infty, \infty)$

D: $9x + 20 > 0$

$x > -\frac{20}{9}$

$\boxed{D_F: \left(-\frac{20}{9}, \infty\right)}$

2) $f(x) = \dfrac{12x - 16}{\sqrt{20x - 16}}$ → D: $(-\infty, \infty)$

D: $20x - 16 > 0$

$x > \frac{4}{5}$

$\boxed{D_F: \left(\frac{4}{5}, \infty\right)}$

3) $f(x) = \dfrac{3x^2 + 15x}{\sqrt{x - 25}}$ → D: $(-\infty, \infty)$

D: $x - 25 > 0$

$x > 25$

$\boxed{D_F: (25, \infty)}$

4) $f(x) = \dfrac{\sqrt{x - 16}}{\sqrt{8x - 2}}$ → $x - 16 \geq 0$

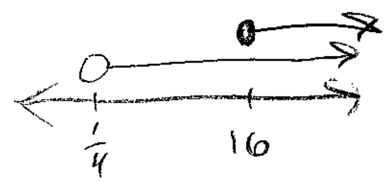
D: $x \geq 16$

$[16, \infty)$

$8x - 2 > 0$

D: $x > \frac{1}{4}$

$\left(\frac{1}{4}, \infty\right)$



$\boxed{D_F: [16, \infty)}$

Perform the indicated operation. Find the domain of the combined or composite functions in interval notation. Show any work necessary.

5) $g(x) = \sqrt{4x+4}$
$f(x) = x + 2 \Rightarrow D: (-\infty, \infty)$
Find $g(f(x))$

$g(f(x)) = \sqrt{4f(x)+4}$

$= \sqrt{4(x+2)+4}$

$= \boxed{\sqrt{4x+12}}$

$4x + 12 \geq 0$
$x \geq -3$

$\boxed{D_F: [-3, \infty)}$

6) $g(x) = 3x + 3$
$h(x) = -2x^3 - 4$ $\Big\} D: (-\infty, \infty)$
Find $g(x) \cdot h(x)$

$g(x) \cdot h(x) = (3x+3)(-2x^3-4)$

or

$= -6x^4 - 6x^3 - 12x - 12$

$\boxed{D_F: (-\infty, \infty)}$

7) $g(x) = x - 3$
$f(x) = -3x - 1$ $\Big\} D: (-\infty, \infty)$
Find $(g - f)(x)$

$g(x) - f(x) = x - 3 - (-3x - 1)$

$= x - 3 + 3x + 1$

$\boxed{= 4x - 2}$

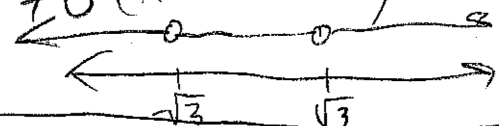
$\boxed{D_F: (-\infty, \infty)}$

8) $g(x) = -x + 2$
$h(x) = x^2 - 3$ $\Big\} D: (-\infty, \infty)$
Find $\left(\frac{g}{h}\right)(x)$

$\boxed{\frac{g(x)}{h(x)} = \frac{-x+2}{x^2-3}}$

$x^2 - 3 \neq 0$ (Rational func.)

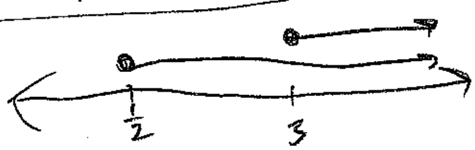
$x \neq \pm\sqrt{3}$



$D_F: (-\infty, -\sqrt{3}) \cup (-\sqrt{3}, \sqrt{3}) \cup (\sqrt{3}, \infty)$

9) $g(x) = \sqrt{x-3} \longrightarrow D: [3, \infty)$
$f(x) = \sqrt{2x-1}$ $D: [\frac{1}{2}, \infty)$
Find $(g - f)(x)$

$\boxed{g(x) - f(x) = \sqrt{x-3} - \sqrt{2x-1}}$



$\boxed{D_F: [3, \infty)}$

10) $f(x) = \sqrt{4x-5} \longrightarrow D: [\frac{5}{4}, \infty)$
$g(x) = x^2 - 5$ $D: (-\infty, \infty)$
Find $f(x) - g(x)$

$f(x) - g(x) = \sqrt{4x-5} - (x^2 - 5)$

$\boxed{= \sqrt{4x-5} - x^2 + 5}$

$\boxed{D_F: [\frac{5}{4}, \infty)}$

State the domain and range. Use interval notation.

11) $f(x) = 3(x-4)^2 + 3$

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

R: $[3, \infty)$

12) $f(x) = -2\left(x + \frac{3}{2}\right)^2 + \frac{7}{2}$

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

R: $(-\infty, \frac{7}{2}]$

13) $y = -3|3x-1| - 2$

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

R: $(-\infty, -2]$

14) $y = -2|2x| + 3$

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

R: $(-\infty, 3]$

Find the inverse of each function.

15) $f(x) = \frac{4}{-x+2} - 1$

$y = \frac{4}{-x+2} - 1$

$x = \frac{4}{-y+2} - 1$

$(x+1) = \frac{4}{-y+2} \cdot (-y+2)$

$(x+1)(-y+2) = 4$

$\rightarrow -y+2 = \frac{4}{x+1} - 2$

$\frac{-y}{-1} = \frac{4}{x+1} - 2 \Big/ -1$

$\boxed{f^{-1}(x) = \frac{-4}{x+1} + 2}$

16) $f(x) = (x+2)^3$

$y = (x+2)^3$

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

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

$\boxed{f^{-1}(x) = \sqrt[3]{x} - 2}$

State if the given functions are inverses. Use the composition method to determine if they are or not.

17) $g(x) = \sqrt[3]{x-2} + 2$
$f(x) = 2 + (x-2)^3$

$f(g(x)) = 2 + (g(x) - 2)^3$

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

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

$= 2 + x - 2$

$= x$

* Yes, inverses!

18) $g(x) = -(x+1)^5$
$f(x) = \sqrt[5]{x-2} - 1$

$g(f(x)) = -(f(x) + 1)^5$

$= -(\sqrt[5]{x-2} - 1 + 1)^5$

$= -(\sqrt[5]{x-2})^5$

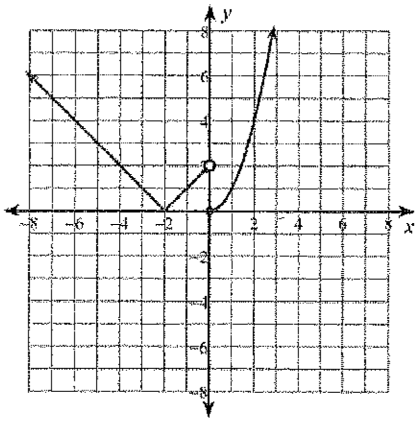
$= -(x-2)$

$= -x+2$

* Not inverses!

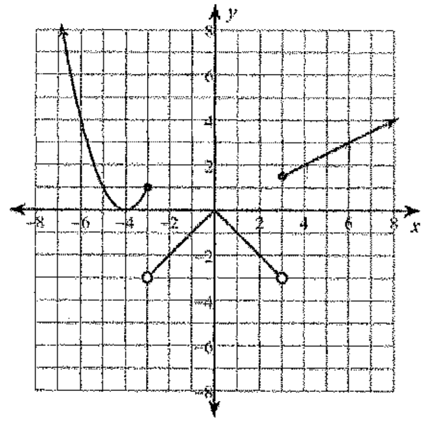
Write a piecewise function for the following graphs.

19.



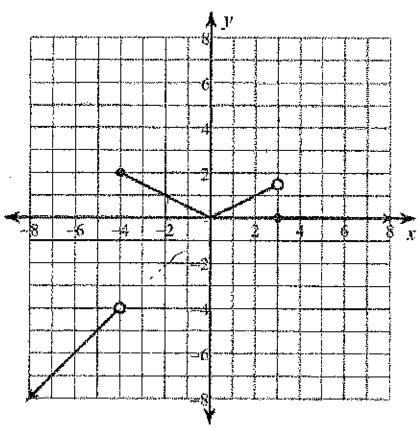
$$f(x)=\begin{cases} |x+2| & \text{if } (-\infty,0) \\ x^2 & \text{if } [0,\infty) \end{cases}$$

20.



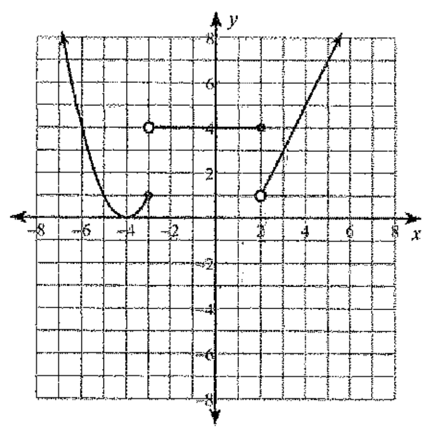
$$f(x)=\begin{cases} (x+4)^2 & \text{if } (-\infty,-3] \\ -|x| & \text{if } (-3,3) \\ \frac{1}{2}x & \text{if } [3,\infty) \end{cases}$$

21.



$$f(x)=\begin{cases} x & \text{if } (-\infty,-4) \\ \frac{1}{2}|x| & \text{if } [-4,3) \\ 0 & \text{if } x=3 \end{cases}$$

22.



$$f(x)=\begin{cases} (x+4)^2 & \text{if } (-\infty,-3] \\ 4 & \text{if } (-3,2] \\ 2x-3 & \text{if } (2,\infty) \end{cases}$$