$(f+g)(3)$

$f(3)+g(3)$

$.5 + 3$

3.5

1f.)

$\sqrt[n]{3 \cdot 2^n \cdot x^{2n} y^n \cdot y^3}$

$2x^n|y|\sqrt[n]{3y^3}$

7.) $-3x^{1/3} + 4x^{1/2} - (5x^{1/3} + 4x^{1/2})$

$-8x^{1/3}$

$\{x \mid x \geq 0\}$

13.) $4x^{2/3} \cdot 5x^{1/2}$

$20x^{7/6}$

$x^{1/2} = \sqrt{x}$

$\frac{2}{3} + \frac{1}{2}$

$\frac{7}{6}$

$\{x \mid x \geq 0\}$

3.3: Perform Function Operations and Composition

Find the domain in set notation.

1. $f(x) = \sqrt{x}$ $\{x \mid x \geq 0\}$
2. $g(x) = \frac{1}{x}$ $\{x \mid x \neq 0\}$
3. $h(x) = x^{3/4}$ $\{x \mid x \geq 0\}$ (even root)
4. $r(x) = \frac{1}{x-2}$ $\{x \mid x \neq 2\}$
5. $f(x) = x^2 - 3x + 7$ $\{x \mid x \in R\}$
6. $f(x) = \frac{1}{x^2-9}$ $\{x \mid x \neq \pm 3\}$

7 $m(x) = \sqrt{x-2}$ $\{x \mid x \geq 2\}$

8 $k(x) = \dfrac{1}{\sqrt{x-2}}$ $\{x \mid x > 2\}$

Function Compositions

$$f(g(x)) \overset{\text{or}}{=} (f \circ g)(x)$$

outer function — inner function — outer — inner

$f(x) = x^2 - 4 \qquad g(x) = 2x + 3$

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

$$= 4x^2 + 12x + 9 - 4 = 4x^2 + 12x + 5$$

$f(x) = x^2 - 4 \qquad g(x) = 2x + 3$

---

① $g(f(x)) = 2(x^2 - 4) + 3$

$= 2x^2 - 8 + 3 = 2x^2 - 5$

② $g(f(4))$

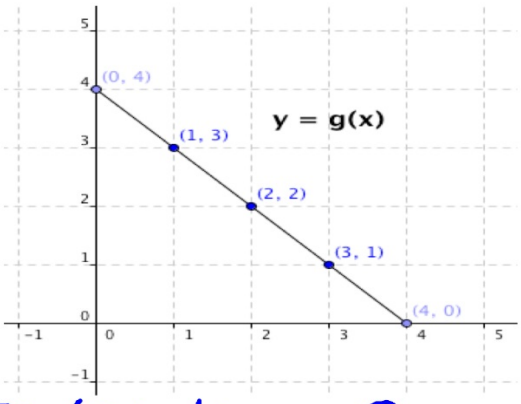
$2(4)^2 - 5$

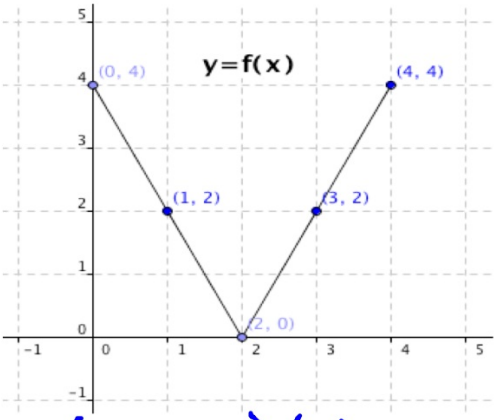
27

$f(4) = 12$

$g(f(4)) =$

$g(12) = 27$





① $\left(\frac{g}{f}\right)(1) = \frac{3}{2}$

② $f(g(3)) = 2$

$f(1)$

③ $(f \circ f)(3) = 0$

or

$f(f(3))$

How to determine the domain of a composite function

1) Write down the domain of the function to plug in.
For example: for $f(g(x))$, find the domain of $g(x)$

2) Compose the function. Then find the domain of the composed functions $f(g(x))$ and combine the domain of $g(x)$ and $f(g(x))$.

The original domain of $g(x)$ does not disappear!

Find each composition and state the domain.

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

$e(x) = x - 2$

$b(x) = x^2$

$d(x) = \frac{1}{x}$

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

1. $a(e(x)) = \sqrt{x-2}$ $\{x \mid x \geq 2\}$

   All Reals

2. $d(a(x)) = \frac{1}{\sqrt{x}}$ $\{x \mid x > 0\}$

   $x \geq 0$

3. $d(f(x)) = \frac{1}{x^2 - 16}$ $\{x \mid x \neq \pm 4\}$

   All reals

$$h(x) = x^2 - 3x + 1$$

$$m(x) = 5x$$

$$h(m(x)) = (5x)^2 - 3(5x) + 1$$

$$= 25x^2 - 15x + 1$$