17.) $$\frac{5x^{1/2}}{4x^{2/3}} = \frac{5}{4}x^{-1/6} = \frac{5}{4x^{1/6}}$$

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

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

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

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

$\cancel{2}\cancel{m}\,|n|\sqrt[4]{5mn^2}$

$\sqrt[4]{5mn^2 \cdot 16m^4n^4}$

$\sqrt[4]{80m^5n^6}$

82.) a.) $\sqrt[4]{32x^4y^5}$

even index
even exponent
odd outside exponent

$2|x|y\sqrt[4]{2y}$

82 c.) $\sqrt[3]{8^2x^6y^{14}} = \sqrt[3]{64x^6y^{14}}$

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

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

$20x^{\frac{1}{2}+\frac{2}{3}}$

$20x^{7/6}$

17.) $\dfrac{5x^{1/2}}{4x^{2/3}} = \dfrac{5}{4}x^{1/2-2/3} = \dfrac{5}{4}x^{-1/6}$

$= \dfrac{5}{4x^{1/6}}$

3.3 Function Compositions

<u>Finding Domain Algebraically</u>

Polynomials and Odd Roots

D: All reals

ex: Find the domain. State the answer in set notation.

a) $y = x^4 - 2x + 1$ $\{x \mid x \in R\}$ or $(-\infty, \infty)$

b) $y = \sqrt[3]{x^2 + 2x - 3}$ $\{x \mid x \in R\}$

Even Roots

D: *set the radicand ≥ 0*

ex: Find the domain. State the answer in set notation.

c) $y = \sqrt[4]{x+1}$

$x+1 \geq 0$

$x \geq -1$

$\{x \mid x \geq -1\}$

d) $y = \sqrt{-x}$

$-x \geq 0$

$x \leq 0$

$\{x \mid x \leq 0\}$

Fractions involving polynomial functions

Fractions: $y = \dfrac{f(x)}{g(x)}$

D: Set $g(x) = 0$ to find the restrictions

ex: Find the domain. State the answer in set notation.

e) $y = \dfrac{x+1}{2x-5}$

$2x - 5 = 0$

$x = \frac{5}{2}$

$\{x \mid x \neq \frac{5}{2}\}$

ex: Find the domain. State the answer in set notation.

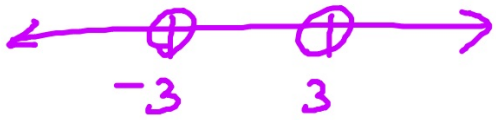
f) $y = \dfrac{x^3 - 7x^2 + 1}{x^2 - 9}$

$x^2 - 9 = 0$

$x^2 = 9$

$x = \pm 3$

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



$(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$

g) $y = \dfrac{x^3 - 7x^2 + 1}{x^2 + 9}$

$x^2 + 9 = 0$

$\{x \mid x \in R\}$

ex: Find the domain. State the answer in set notation.

h) $y = \dfrac{6}{x^2 - 3x + 2}$

$\{x \mid x \neq 1, 2\}$

$x^2 - 3x + 2 = 0$

$(x-2)(x-1) = 0$

$x = 1, 2$

ex: Find the domain. State the answer in set notation.

i) $y = 5x^{3/4} - 2x$

$x \geq 0$ all reals

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

j) $y = \sqrt[3]{x} - \sqrt{x}$

all reals $x \geq 0$

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

Look at each term's domain

The domain will be the intersection of both domains

ex: Find the domain. State the answer in set notation.

k) $y = \dfrac{3x-1}{\sqrt{x+9}}$

l) $y = \dfrac{\sqrt{x+9}}{3x-1}$

Function Compositions

$$(f \circ g)(x) = f(g(x))$$

$$(g \circ f)(x) = g(f(x))$$

ex: Let

$$f(x) = \sqrt{x} \qquad m(x) = x^2$$

$$g(x) = \sqrt[5]{x} \qquad n(x) = x + 5$$

$$h(x) = \frac{1}{x} \qquad p(x) = x^2 - 10x + 25$$

Find the composition, if possible.

a) $(f \circ g)(1) = 1$

ex: Let

$$f(x) = \sqrt{x} \qquad m(x) = x^2$$

$$g(x) = \sqrt[5]{x} \qquad n(x) = x + 5$$

$$h(x) = \frac{1}{x} \qquad p(x) = x^2 - 10x + 25$$

Find the composition, if possible.

b) $(n \circ m)(0) = 5$

ex: Let

$$f(x) = \sqrt{x} \qquad m(x) = x^2$$

$$\frac{1}{\frac{1}{32}} \qquad g(x) = \sqrt[5]{x} \qquad n(x) = x + 5$$

$$h(x) = \frac{1}{x} \qquad p(x) = x^2 - 10x + 25$$

32

Find the composition, if possible.

c) $(f \circ h)\left(\frac{1}{32}\right) = \sqrt{32} = 4\sqrt{2}$

32

ex: Let

$$f(x) = \sqrt{x} \qquad m(x) = x^2$$

$$g(x) = \sqrt[5]{x} \qquad n(x) = x + 5$$

$$h(x) = \frac{1}{x} \qquad p(x) = x^2 - 10x + 25$$

Find the composition, if possible.

d) $(f \circ n)(-6) = \sqrt{-1}$ (nonreal)

ex: Let

$$f(x) = \sqrt{x} \qquad m(x) = x^2$$

$$g(x) = \sqrt[5]{x} \qquad n(x) = x + 5$$

$$h(x) = \frac{1}{x} \qquad p(x) = x^2 - 10x + 25$$

Find the composition, if possible.

e) $(p \circ h)(0)$ undefined (no solution)

To find the domain of a composite function f(g(x)).

1) Find the domain of g(x)

2) Find the domain of f(g(x))

***If g(x) has a restricted domain, the composite will include that restriction*

ex: Let

$$f(x) = \sqrt{x} \qquad m(x) = x^2$$

$$g(x) = \sqrt[5]{x} \qquad n(x) = (x+5)$$

$$h(x) = \frac{1}{x} \qquad p(x) = x^2 - 10x + 25$$

Find the composition and state the domain.

a) $(f \circ n)(x) = \sqrt{x+5}$

$x+5 \geq 0$

$x \geq -5$

$\{x \mid x \geq -5\}$

ex: Let

$$f(x) = \sqrt{x} \qquad m(x) = x^2$$

$$g(x) = \sqrt[5]{x} \qquad n(x) = x + 5$$

$$h(x) = \frac{1}{x} \qquad p(x) = (x^2 - 10x + 25)$$

Find the composition and state the domain.

b) $(h \circ p)(x) = \dfrac{1}{x^2 - 10x + 25}$

$x^2 - 10x + 25 = 0$

$(x-5)^2 = 0$

$x = 5$

$\{x \mid x \neq 5\}$

ex: Let

$$f(x) = \sqrt{x} \qquad m(x) = x^2$$

$$g(x) = \sqrt[5]{x} \qquad n(x) = x + 5$$

$$h(x) = \frac{1}{x} \qquad p(x) = x^2 - 10x + 25$$

Find the composition and state the domain.

☆ c) $(f \circ m)(x) = \sqrt{x^2} = |x|$ $\quad D: \{x \mid x \in R\}$

ex: Let

$$f(x) = \sqrt{x} \qquad m(x) = x^2$$

$$g(x) = \sqrt[5]{x} \qquad n(x) = x + 5$$

$$h(x) = \frac{1}{x} \qquad p(x) = x^2 - 10x + 25$$

Find the composition and state the domain.

$(m \circ f)(x) = (\sqrt{x})^2 = x \qquad \{x \mid x \geq 0\}$

ex: Let

$$f(x) = \sqrt{x} \qquad m(x) = x^2$$

$$g(x) = \sqrt[5]{x} \qquad n(x) = (x+5)$$

$$h(x) = \frac{1}{x} \qquad p(x) = x^2 - 10x + 25$$

Find the composition and state the domain.

d) $(p \circ n)(x) = (x+5)^2 - 10(x+5) + 25$

$= x^2 + 10x + 25 - 10x - 50 + 25$ D: $\{x \mid x \in R\}$

$= x^2$

ex: Let

$$f(x) = \sqrt{x} \qquad m(x) = x^2$$

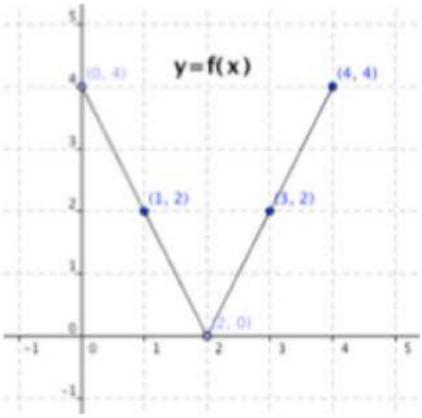
$$g(x) = \sqrt[5]{x} \qquad n(x) = x + 5$$

$$h(x) = \frac{1}{x} \qquad p(x) = x^2 - 10x + 25$$

Find the composition and state the domain.

e) $(n \circ h)(x) = \frac{1}{x} + 5 = \frac{1+5x}{x}$ $\{x \mid x \neq 0\}$

3.3 Notes - WKST

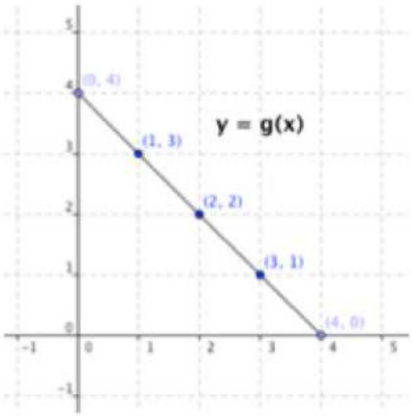


8. $(f \circ g)(2) = f(g(2))$

$= f(2)$

$= 0$

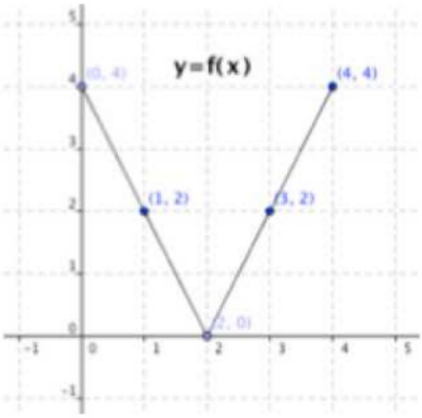
9. $(g \circ f)(3) = 2$

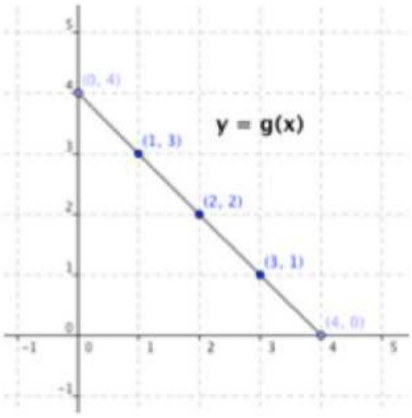


10. $(f \circ f)(1) = 0$

$f(2)$

3.3 Notes - WKST





11. $(g \circ g)(3) = 3$

2

2

12. $(f \circ (g \circ f))(1) = 0$

*See printout.

REVIEW

If $f(x) = x^2 + 2x + 1$ and $g(x) = 3(x+1)^2$, which is an equivalent form of $f(x) + g(x)$?

A $x^2 + 4x + 2$

B $4x^2 + 2x + 4$

C $4x^2 + 8x + 4$

D $10x^2 + 20x + 10$

REVIEW

Which expression represents $f(g(x))$ if $f(x) = x^2 - 1$ and $g(x) = x + 3$?

A $x^3 + 3x^2 - x - 3$

B $x^2 + 6x + 8$

C $x^2 + x + 2$

D $x^2 + 8$

REVIEW

ex: Simplify.

$$\sqrt[4]{48xy^{12}z^{9}}$$

$$2|y^{3}|z^{2}\sqrt[4]{3xz}$$

REVIEW

ex: Simplify.

$$-64^{5/6}$$

$$-1 \cdot 64^{5/6}$$

$$-32$$

REVIEW

Which is a simplified form of $\frac{3a^2b^3c^{-2}}{(a^{-1}b^2c)^3}$?

A $\frac{3a^5}{b^3c^5}$

B $\frac{3ab}{c^5}$

C $\frac{3}{b^2c^5}$

D $\frac{3}{ab^3c^5}$