Unit 3 Review

Inverse and Equivalent Expressions

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Topics:

- Inverse Functions
- Multiplying Polynomials
- Adding and Subtracting Polynomials
- The Four Operations on Fractions
- Simplifying Rational Expressions
- Multiplying and Dividing Rational Expressions
- Adding and Subtracting Rational Expressions
- Solving Rational Equations

Nelson Page 206
#s 5 - 8, 15, 20, 21, 23, 24, 31 & 32

Mar 19-7:45 AM

Solutions

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5. Which pairs of functions are equivalent?
   a) i b) i and ii c) i and iii d) iii and iv

   i) $h(x) = (x + 6)(x + 3)(x - 6)$ and $b(x) = (x + 3)(x^2 - 36)$
   ii) $b(t) = (3t + 2)^3$ and $c(t) = 27t^3 + 54t^2 + 36t + 8$
   iii) $h(t) = (4 - x)^3$ and $h(t) = (x - 4)^3$
   iv) $f(x) = (x^2 - 4x) - (2x^2 + 2x - 4) - (x^2 + 1)$ and $b(x) = (2x - 5)(2x - 1)$

(i) $h(x) = (x+6)(x-6)(x+3)$

$= (x^2 + 6x - 6x - 36)(x+3)$

$= (x^2 - 36)(x+3) = b(x)$

(ii) $b(t) = (3t+2)^3$

$= 1(3t)^3(2)^0 + 3(3t)^2(2)^1 + 3(3t)^1(2)^2 + 1(3t)^0(2)^3$

$= 27t^3 + 54t^2 + 36t + 8 = c(t)$

1
1 1
1 2 1
1 3 3 1

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6. Which expression has the restrictions $y \neq -1, 0, \frac{1}{2}$ on its variable?

a) $\frac{3y}{y-2} \times \frac{4(y-2)}{6y}$

b) $\frac{5y(y+3)}{4y} \times \frac{(y-5)}{(y+3)}$

c) $\frac{(3y+1)}{(2y-1)} \div \frac{3y(y+1)}{2y-1}$

d) $\frac{10y}{y+2} \div \frac{5}{2(y+2)}$

When dividing we look at the numerator AND denominator in the divisor.

$$\frac{\text{QUOTIENT} + \text{REMAINDER}}{}$$

DIVISOR | DIVIDEND

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7. Identify the correct product of $\frac{x^2-5x+6}{x^2-1} \times \frac{x^2-4x-5}{x^2-4}$.

a) $\frac{(x+3)(x-5)}{(x-1)(x+2)}$

b) $\frac{(x-3)(x+5)}{(x+1)(x+2)}$

c) $\frac{(x-3)(x-5)}{(x-1)(x-2)}$

d) $\frac{(x-3)(x-5)}{(x-1)(x+2)}$

Factor

Restrictions

Simplify

$$\frac{\cancel{(x-2)}(x-3)}{(x-1)\cancel{(x+1)}} \times \frac{\cancel{(x+1)}(x-5)}{(x+2)\cancel{(x-2)}}$$

$x \neq \pm 1, \pm 2$

$$\frac{(x-3)(x-5)}{(x-1)(x+2)}$$

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8. Identify the correct sum of $\frac{5x-6}{x+1} + \frac{3x}{x-4}$.

a) $\frac{2x^2+23x+24}{(x+1)(x-4)}$ c) $\frac{15x^2-18x}{(x+1)(x-4)}$

b) $\frac{8x^2-23x+24}{(x+1)(x-4)}$ d) $\frac{8x^2-29x+24}{(x+1)(x-4)}$

Factor (if possible)
Restrictions
Cross multiply to create common denominator
Simplify

$$\frac{5x-6}{x+1} + \frac{3x}{x-4}$$

$$x \neq -1, 4$$

$$= \frac{(5x-6)(x-4)}{(x+1)(x-4)} + \frac{3x(x+1)}{(x-4)(x+1)}$$

$$= \frac{5x^2-20x-6x+24}{(x+1)(x-4)} + \frac{3x^2+3x}{(x+1)(x-4)}$$

$$= \frac{8x^2-23x+24}{(x+1)(x-4)}$$

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15. For $f(x) = 2(x-3)^2 + 5, x \geq 3$, determine the equation for f^{-1}.

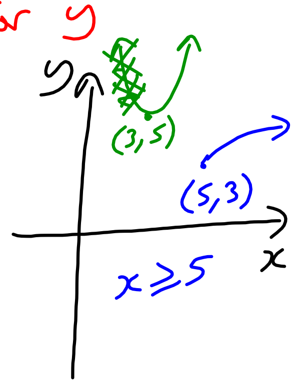
a) $y = 3 + \sqrt{\frac{x-5}{2}}, x \geq 5$

b) $y = 3 - \sqrt{\frac{x-5}{2}}, x \geq 5$

c) $y = 3 \pm \sqrt{\frac{x-5}{2}}$

d) $y = 3 + \sqrt{\frac{x+5}{2}}, x \leq 5$

Find the inverse (f^{-1})
Rewrite
Interchange x and y
Solve for y



$$f(x) = 2(x-3)^2 + 5$$

$$y = 2(x-3)^2 + 5$$

$$x = 2(y-3)^2 + 5$$

$$\frac{x-5}{2} = \frac{2(y-3)^2}{2}$$

$$\sqrt{\frac{x-5}{2}} = y-3$$

$$3 + \sqrt{\frac{x-5}{2}} = y$$

$$f^{-1}(x) = 3 + \sqrt{\frac{x-5}{2}}$$

$$x \geq 5$$

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20. If $f(x) = 5x - 7$, then

a) $f^{-1}(x) = 7x - 5$

b) $f^{-1}(x) = x - 7$

c) $f^{-1}(x) = \frac{x-5}{7}$

d) $f^{-1}(x) = \frac{x+7}{5}$

$$y = 5x - 7$$
$$x = 5y - 7$$
$$\frac{x+7}{5} = \frac{5y}{5}$$
$$f^{-1}(x) = \frac{x+7}{5}$$

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21. The inverse of $g(x) = x^2 - 5x - 6$ is

a) $g^{-1}(x) = \left(x - \frac{1}{2}\right)^2 - \frac{49}{4}$

b) $g^{-1}(x) = \frac{1}{2} \pm \sqrt{x - \frac{49}{4}}$

c) $g^{-1}(x) = \frac{5}{2} \pm \sqrt{x + \frac{49}{4}}$

d) $g^{-1}(x) = \left(x + \frac{1}{2}\right)^2 + \frac{49}{4}$

Can only find the inverse of a quadratic if it's in VERTEX FORM. Then use SAMDEB

$$g(x) = x^2 - 5x - 6$$
$$h = \frac{-b}{2a} = \frac{5}{2(1)} = \frac{5}{2}$$
$$k = g\left(\frac{-b}{2a}\right) = \left(\frac{5}{2}\right)^2 - 5\left(\frac{5}{2}\right) - 6$$
$$= \frac{25}{4} - \frac{25}{2} - 6$$
$$= -\frac{49}{4}$$
$$\Rightarrow g(x) = \left(x - \frac{5}{2}\right)^2 - \frac{49}{4}$$
$$y = \left(x - \frac{5}{2}\right)^2 - \frac{49}{4}$$
$$x = \left(y - \frac{5}{2}\right)^2 - \frac{49}{4}$$
$$x + \frac{49}{4} = \left(y - \frac{5}{2}\right)^2$$
$$\sqrt{x + \frac{49}{4}} = y - \frac{5}{2}$$
$$\frac{5}{2} \pm \sqrt{x + \frac{49}{4}} = y$$

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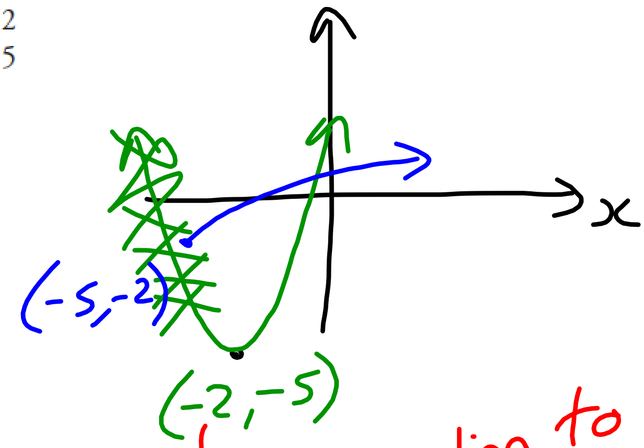
23. If $f(x) = 3(x+2)^2 - 5$, the domain must be restricted to which interval if the inverse is to be a function?

a) $x \geq -5$ c) $x \geq 2$

b) $x \geq -2$ d) $x \geq 5$



restriction to make $f^{-1}(x)$ a function

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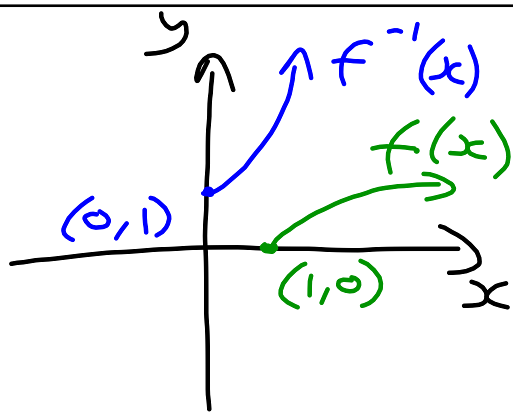
24. The inverse of $f(x) = \sqrt{x-1}$ is

a) $f^{-1}(x) = x^2 + 1, x \leq 1$

b) $f^{-1}(x) = x^2 - 1, x \geq 1$

c) $f^{-1}(x) = x^2 + 1, x \geq 0$

d) $f^{-1}(x) = x^2 - 1, x \leq 1$



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

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31. The simplified form of $\frac{7}{ab} - \frac{2}{b} + \frac{1}{3a^2}$ is

a) $\frac{6}{ab - b + 3a^2}, a, b \neq 0$

b) $\frac{21a - 6a^2 + b}{3a^2b}, a, b \neq 0$

c) $\frac{7a - 2a^2 + b}{3a^2b}, a, b \neq 0$

d) $\frac{7a - 2b + ab}{3a^3b^2}, a, b \neq 0$

Factor (if possible)
Lowest common denom.
Restrictions
Equivalent fractions
Simplify

$LCD = 3a^2b$

$$= \frac{7(3a)}{ab(3a)} - \frac{2(3a^2)}{b(3a^2)} + \frac{1(b)}{3a^2(b)}$$

$a \neq 0$
$b \neq 0$

$$= \frac{21a}{3a^2b} - \frac{6a^2}{3a^2b} + \frac{b}{3a^2b}$$

$$= \frac{-6a^2 + 21a + b}{3a^2b}$$

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32. The simplified form of $\frac{x^2 - 4}{x + 3} \div \frac{2x + 4}{x^2 - 9}$ is

a) $\frac{2(x - 2)(x + 2)^2}{(x + 3)^2(x - 3)}$

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

c) $\frac{(x - 2)(x - 3)}{2}$

d) $\frac{2(x - 3)}{x - 2}$

Factor
Restrictions
Change ÷ to × and multiply by the reciprocal
Simplify

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

included as a restriction because it becomes a denominator.

$x \neq \pm 3, -2$

$$= \frac{\cancel{(x+2)}(x-2)}{\cancel{x+3}} \times \frac{\cancel{(x+3)}(x-3)}{2\cancel{(x+2)}}$$

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

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