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Unit 11 - Rational Expressions and Functions Review Guide

Simplify the following rational expressions.

1. $\dfrac{30x^2y}{15x+10xy}$

2. $\dfrac{x^2-16}{x+4}$

3. $\dfrac{2x+4y}{2xy}$

4. $\dfrac{9a+6ab}{3a}$

5. $\dfrac{5a^2b+5a^2c}{15ab+15ac}$

6. $\dfrac{2x^2-6x}{3x-x^2}$

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Multiply the following rational expressions.

7. $\frac{3x+6}{x} \times \frac{x}{3x}$

8. $\frac{a-b}{3a^2b^3} \times \frac{9a^4b^2}{a-b}$

9. $\frac{5a-5b}{xy^2} \times \frac{x^2y}{2a-2b}$

10. $\frac{r^2+r}{4} \times \frac{8}{r^2-1}$

Divide the following rational expressions.

11. $\frac{25p^{10}}{9p^5} \div \frac{15p^6}{10p^4}$

12. $\frac{4c+4}{c^2-25} \div \frac{20}{c^2-5c}$

13. $\frac{5x-20}{10x} \div \frac{7x-28}{14x^2}$

14. $\frac{4a+12}{2a-10} \div \frac{a^2-9}{a^2-a-20}$

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Unit 11 - Rational Expressions and Functions Review Guide

Divide the following Polynomials

15. $50x^5 - 7x^4 + x^2 \text{ by } x$

16. $5b^4 - 10b^3 - 15b^2 + 10b \text{ by } 5b$

17. $a^3 - 6a^2 + 12a - 8 \text{ by } a - 2$

18. $y^2 - y - 110 \text{ by } y + 10$

19. $12x^3 - 5x^2 - 3x - 5 \text{ by } 4x - 3$

20. $27x^3 + 8 \text{ by } 3x + 2$

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Add or subtract the following rational expressions.

21. $\frac{p^2}{p-1}+\frac{-p}{p-1}$

22. $\frac{3s+7}{s^2-9}+\frac{s+5}{s^2-9}$

23. $\frac{4}{5z}-\frac{1}{2z}$

24. $\frac{4x}{x^2-36}+\frac{2}{x-6}$

25. $\frac{x}{3}-\frac{2y}{3}+\frac{z}{3}$

26. $\frac{6-4p}{8}-\frac{3-3p}{6}$

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Find the unknown value of the following rational expressions.

27. $\frac{6}{x-3}=3$

28. $5-\frac{12}{a}=\frac{5}{3}$

29. $\frac{4t}{3}=15-\frac{t}{6}$

30. $\frac{6}{b}+22=24$

31. $\frac{x}{12}+\frac{x}{6}=1$

32. $\frac{1}{x}+\frac{1}{16}=\frac{1}{10}$

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Unit 11 - Rational Expressions and Functions Review Guide

Solve Problems Involving Inverse Variation.

Variable z is inversely proportional to$a$. If $z = 5$ when $a = 15$

33. Find z when a =20.

34. Find z when a = 10.

35. How long will it take a car to travel a certain distance at 80 km/ h if the same distance can be traveled in 6 hours at 40km/h.

36. The time required for two pipes to drain a pool is 10 hours. How long will it take for 5 pipes to drain the same pool?

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Unit 11 - Rational Expressions and Functions Review Guide

37. Find the y- intercept of $f(x)=\frac{4x-2}{x+2}$ **.**

38. Find the x - intercept of $f(x)=\frac{4x-2}{x+2}$ **.**

39. Find the vertical and horizontal asymptote of $f(x)=\frac{4x-2}{x+2}$ **.**

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Unit 11 - Rational Expressions and Functions Review Guide

ANSWER

Simplify the following rational expressions.

1. $\dfrac{30x^2y}{15x+10xy}$

Solution:

$$=\frac{30x^2y}{5x(3+2y)}=\frac{6xy}{3+2y}$$

2. $\dfrac{x^2-16}{x+4}$

Solution:

$$=\frac{(x+4)(x-4)}{x+4}=x-4$$

3. $\dfrac{2a+4b}{2ab}$

Solution:

$$=\frac{2(a+2b)}{2ab}=\frac{a+2b}{ab}$$

4. $\dfrac{9x+6xy}{3x}$

Solution:

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

5. $\dfrac{5x^2y+5x^2z}{15xy+15xz}$

Solution:

$$\frac{(5x^2)(y+z)}{(15x)(y+z)}=\frac{5x(x)}{5x(3)}=\frac{x}{3}$$

6. $\dfrac{2a^2-6a}{3a-a^2}$

Solution:

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

Multiply the following rational expressions.

7. $\dfrac{3d+6}{d}\times\dfrac{d}{3d}$

Solution:

$$=\frac{3(d+2)}{d}\times\frac{d}{3d}=\frac{d+2}{d}$$

8. $\dfrac{x-y}{3x^2y^3}\times\dfrac{9x^4y^2}{x-y}$

Solution:

$$=\frac{3x}{y}$$

9. $\dfrac{5x-5y}{xy^2}\times\dfrac{x^2y}{2x-2y}$

Solution:

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

10. $\dfrac{p^2-p}{4}\times\dfrac{8}{p^2-1}$

Solution:

$$=\frac{p(p-1)}{(4)}\times\frac{2(4)}{(p+1)(p-1)}=\frac{2r}{p+1}$$

Divide the following rational expressions.

11. $\dfrac{25r^5}{9r^5}\div\dfrac{5r^4}{90r^7}$

Solution:

$$=\frac{25r^5}{9r^5}\times\frac{90r^7}{5r^4}=50r^3$$

12. $\dfrac{4a+4}{a^2-25}\div\dfrac{20}{a^2-5a}$

Solution:

$$=\frac{4(a+1)}{(a+5)(a-5)}\times\frac{a(a-5)}{5(4)}=\frac{4(a+1)}{5(a+5)}$$

13. $\dfrac{5g-20}{10g}\div\dfrac{7g-28}{14g^2}$

14. $\dfrac{4t+12}{2t-10}\div\dfrac{t^2-9}{t^2-t-20}$

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Solution:

$$= \frac{5g-20}{10g} \times \frac{14g^2}{7g-28} = \frac{5(g-4)}{5(2g)} \times \frac{7g(2g)}{7(g-4)} = g$$

Solution:

$$= \frac{4(t+3)}{2(t-5)} \times \frac{(t+4)(t-5)}{(t-3)(t+3)} = \frac{4(t+4)}{2} = 2(t+4)$$

Divide the following Polynomials

15. $50r^5 - 7r^4 + r^2 \ \ by \ r$

Solution:

$$\frac{50r^5 - 7r^4 + r^2}{r}$$

$$= 50r^4 - 7r^3 + r$$

16. $5a^4 - 10a^3 - 15a^2 + 10a \ \ by \ 5a$

Solution:

$$\frac{5a^4 - 10a^3 - 15a^2 + 10a}{5a}$$

$$= a^3 - 2a^2 - 3a + 2$$

17. $d^3 - 6d^2 + 12d - 8 \ by \ d - 2$

Solution:

$$\begin{array}{r} d^2 - 4d + 4 \\ d-2 \overline{)\, d^3 - 6d^2 + 12d - 8} \\ \underline{-(d^3 - 2d^2)} \\ -4d^2 + 12d \\ \underline{-(-4d^2 + 8d)} \\ 4d - 8 \\ \underline{-(4d - 8)} \\ 0 \end{array}$$

$$= d^2 - 4d + 4$$

18. $x^2 - x - 110 \ by \ x + 10$

Solution:

$$\begin{array}{r} x - 11 \\ x+10 \overline{)\, x^2 - x - 110} \\ \underline{-(x^2 + 10x)} \\ -11x - 110 \\ \underline{-(-11x - 110)} \\ 0 \end{array}$$

$$= x - 11$$

19. $12a^3 - 5a^2 - 3a - 5 \ by \ 4a - 3$

Solution:

$$\begin{array}{r} 3a^2 + a \\ 4a-3 \overline{)\, 12a^3 - 5a^2 - 3a - 5} \\ \underline{-(12a^3 - 9a^2)} \\ 4a^2 - 3a \\ \underline{-(4a^2 - 3a)} \\ 0 - 5 \end{array}$$

$$= 3a^2 + a - \frac{5}{4a-3}$$

20. $27z^3 + 8 \ by \ 3z + 2$

Solution:

$$\begin{array}{r} 9z^2 - 6z + 4 \\ 3z+2 \overline{)\, 27z^3 \qquad + 8} \\ \underline{-(27z^3 + 18z^2)} \\ -18z^2 \\ \underline{-(-18z^2 - 12z)} \\ 12z + 8 \\ \underline{-(12z + 8)} \\ 0 \end{array}$$

$$= 9z^2 - 6z + 4$$

Add or subtract the following rational expressions.

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21. $\frac{s^2}{s-1}-\frac{-s}{s-1}$

Solution:

$=\frac{s(s+1)}{s-1}$

22. $\frac{3s+7}{s^2-9}-\frac{s+5}{s^2-9}$

Solution:

$=\frac{3s+7-s-5}{s^2-9}=\frac{2s+2}{s^2-9}$

23. $\frac{4}{5z}+\frac{1}{2z}$

Solution:

LCD: $10z$

$=\frac{4(2)+1(5)}{10z}=\frac{8+5}{10z}=\frac{13}{10z}$

24. $\frac{4y}{y^2-36}-\frac{2}{y-6}$

Solution:

LCD: x^2-36

$=\frac{4y-2(y+6)}{y^2-36}=\frac{4y-2y-12}{y^2-36}$

$=\frac{2y-12}{x^2-36}=\frac{2(y-6)}{(x+6)(x-6)}=\frac{2}{x+6}$

25. $\frac{a}{3}+\frac{2a}{3}+\frac{a}{3}$

Solution:

$=\frac{a+2a+a}{3}=\frac{4a}{3}$

26. $\frac{6-4r}{8}+\frac{3-3r}{6}$

Solution:

LCD: 24

$=\frac{(6-4r)(3)+(3-3r)(4)}{8}=\frac{18-12r+12-12r}{8}$

$=\frac{30-24r}{8}$

Find the unknown value of the following rational expressions.

27. $\frac{6}{y+3}=3$

Solution:

$(y+3)\left(\frac{6}{y+3}\right)=(y+3)(3)$

$6=3y+9$

$3y=3$

$y=1$

28. $5+\frac{12}{b}=\frac{5}{3}$

Solution:

$3b\left(5+\frac{12}{a}\right)=3b\left(\frac{5}{3}\right)$

$15b+36=5b$

$10b=-36$

$b=-\frac{36}{10}\ or\ -\frac{18}{5}$

29. $\frac{4d}{3}=15+\frac{d}{6}$

Solution:

$6\left(\frac{4d}{3}\right)=(6)15+(6)\left(\frac{d}{6}\right)$

$12d=90+d$

$11d=90$

$t=\frac{90}{11}$

30. $\frac{6}{a}-22=-24$

Solution:

$a\left(\frac{6}{a}\right)+a(-22)=a(-24)$

$6-22a=-24a$

$-2a=6$

$a=-3$

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31. $\frac{a}{12}-\frac{a}{6}=1$

Solution:

$12\left(\frac{a}{12}\right)-12\left(\frac{a}{6}\right)=12$

$a-2a=12$

$-a=12$

$a=-12$

32. $\frac{1}{x}+\frac{1}{16}=\frac{1}{10}$

Solution:

$\frac{1}{x}=\frac{1}{10}-\frac{1}{16}$

$\frac{1}{x}=\frac{3}{80}$

$3x=80$

$x=\frac{80}{3}$

Solve Problem Involving Inverse Variation.

Variable z is inversely proportional to a. If $z = 5$ when $a = 15$

33. Find z when a =20.

Solution:

$5=\frac{k}{15} \quad k=75$

$z=\frac{75}{20}=3.75$

34. Find z when a = 10.

Solution:

$z=\frac{75}{10}=7.5$

35. How long will it take a car to travel a certain distance at 80 km/ h if the same distance can be traveled in 6 hours at 40km/h.

Solution:

speed	Time
80	6
40	?

$6=\frac{k}{80} \quad k=480$

$t=\frac{480}{40}=12 \text{ hours}$

36. The time required for two pipes to drain a pool is 10 hours. How long will it take for 5 pipes to drain the same pool?

Pipes	Time
2	10
5	?

$10=\frac{k}{2} \quad k=20$

$t=\frac{20}{5}=4 \text{ hours}$

Unit 11 - Rational Expressions and Functions Review Guide

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37. Find the y- intercept of $f(x)=\frac{4x-2}{x+2}$.

Solution:

$$f(0)=\frac{4(0)-2}{(0)+2}=-1$$

38. Find the x - intercept of $f(x)=\frac{4x-2}{x+2}$.

Solution:

$4x-2=0$ $\quad x=\frac{1}{2}$

39. Find the vertical and horizontal asymptote of $f(x)=\frac{4x-2}{x+2}$.

Vertical asymptote

$x+2=0$ $\quad x=-2$

Horizontal asymptote

$$y=\frac{4}{1}=4$$