Honors Math II

Name: Key

Unit 8 Day 1 Homework: Multiply and Divide Rational Expressions

Simplify the rational expression, if possible.

1. $\frac{3x}{3x-6}$ $= \frac{\cancel{3}x}{\cancel{3}(x-2)} = \boxed{\frac{x}{x-2}}$

2. $\frac{x+2}{4(x-3)}$ $\boxed{\text{reduced}}$

3. $\frac{x^2-9}{x^2+5x+6}$ $\frac{\cancel{(x+3)}(x-3)}{\cancel{(x+3)}(x+2)} = \boxed{\frac{x-3}{x+2}}$

4. $\frac{x^2-2x-8}{x^2+7x+10}$ $\frac{(x-4)\cancel{(x+2)}}{(x+5)\cancel{(x+2)}} = \boxed{\frac{x-4}{x+5}}$

Multiply the expressions. Simplify the result.

5. $\frac{4x^2}{3xy^3} \cdot \frac{27xy}{8x}$ $= \boxed{\frac{9x}{2y^2}}$

6. $\frac{18x^2y^3}{7xy^2} \cdot \frac{14xy}{12x^4}$ $\frac{6y^2}{2x^2} = \boxed{\frac{3y^2}{x^2}}$

7. $\frac{6x^3y}{xy^2} \cdot \frac{3x^2y}{8x^3}$ $= \boxed{\frac{9x}{4}}$

8. $\frac{44x^7y^4}{5xy^2} \cdot \frac{12xy^5}{22x^5y^5}$ $\boxed{\frac{24x^2y^2}{5}}$

9. $\frac{x^2-9x+20}{x^2+9x+14} \cdot \frac{x^2+6x+8}{x^2-x-20}$

$\frac{(x-4)\cancel{(x-5)}}{\cancel{(x+2)}(x+7)} \cdot \frac{\cancel{(x+4)}\cancel{(x+2)}}{\cancel{(x-5)}\cancel{(x+4)}}$

$\boxed{\frac{x-4}{(x+7)}}$

10. $\frac{x^3-9x}{x^2+6x+9} \cdot \frac{x^3+3x^2}{3-x}$

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

-1

$\boxed{-x^3}$

Divide the rational expressions. Simplify the result.

11. $\frac{10x^4}{3xy^2} \div \frac{6x^2y}{xy^4}$

$\frac{\cancel{10}x^4}{3xy^2} \cdot \frac{xy^4}{6x^2y} = \boxed{\frac{5x^2y}{9}}$

12. $\frac{16x^2y}{18xy^2} \div \frac{24x^2y}{54x^3y^3}$

$\frac{\cancel{16}x^2y}{\cancel{18}xy^2} \cdot \frac{\cancel{54}x^3y^3}{\cancel{24}x^2y} = \frac{6x^2y}{3}$

$\boxed{2x^2y}$

13. $\frac{12y^3}{5x^2y} \div \frac{3xy}{4x^3y^2}$

$\frac{\cancel{12}^{4}y^3}{5x^{\cancel{2}}\cancel{y}} \cdot \frac{4\cancel{x^3}y^2}{\cancel{3}\cancel{x}\cancel{y}} = \boxed{\frac{16y^3}{5}}$

14. $\frac{32x^4y}{3xy^2} \div \frac{8xy^2}{21y^4}$

$\frac{\cancel{32}^{4}\cancel{x^4}^{x^2}y}{\cancel{3}\cancel{x}\cancel{y^2}} \cdot \frac{\cancel{21}^{7}\cancel{y^4}}{\cancel{8}\cancel{x}\cancel{y^2}}$

$\boxed{28x^2y}$

15. $\frac{9x^2}{3-6x} \div \frac{3x^2-12x}{2x^2-x}$

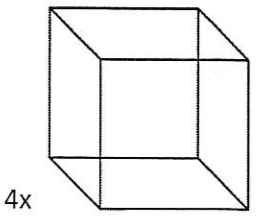
$\frac{\cancel{9}x^2}{\cancel{3}(1-\cancel{2x})} \cdot \frac{x(\cancel{2x-1})^{(-1)}}{\cancel{3x}(x-4)} = \boxed{\frac{-x^2}{x-4}}$

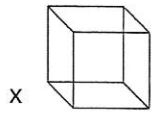
16. $\frac{2x^2+7x-4}{x^2-6x+9} \div \frac{x^2+8x+16}{x^2+x-12}$

$\frac{(2x-1)\cancel{(x+4)}}{(x-3)\cancel{(x-3)}} \cdot \frac{\cancel{(x+4)}\cancel{(x-3)}}{\cancel{(x+4)}\cancel{(x+4)}}$

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

17. A cranberry farmer has two different styles of storage crates to transport the produce from the farm to the processing facility. The first crate style is larger than the second because it is intended for use with mass transit. Use the diagrams below to find the ratio of the volume of the larger crate to the volume of the smaller crate.



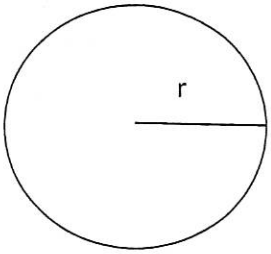


$\frac{4x(3x+6)(2x+12)}{x(2x)(x+6)} =$

$\frac{\cancel{4}^{2}\cancel{x}(3)(x+2)(2)\cancel{(x+6)}}{\cancel{x}(\cancel{2}x)\cancel{(x+6)}}$

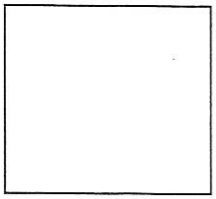
$\frac{12(x+2)}{x}$

18. In the diagrams below, the length of the edge or the square is twice as long as the radius of the circle. Find the ratio of the area of the circle to the area of the square. Write your answer in simplified form.



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

$A = \pi r^2$



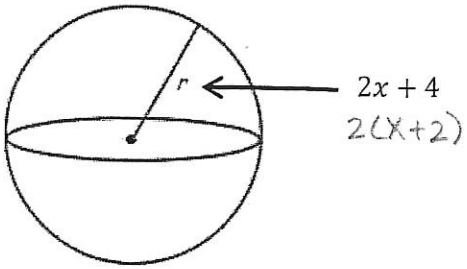
$x = 2r$

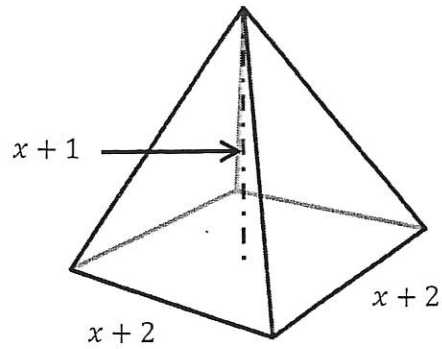
$x = 2r$

$\frac{\pi r^2}{(2r)(2r)} = \frac{\pi r^2}{4r^2} = \boxed{\frac{\pi}{4}}$

$\frac{\pi\left(\frac{x}{2}\right)^2}{x^2} = \frac{\pi \cancel{x^2}}{4 \cdot \cancel{x^2}}$

19. What is the ratio of the volume of the sphere to the volume of the pyramid?





$V = \frac{4}{3}\pi r^3$

$V = \frac{1}{3}(x+2)(x+2)(x+1)$

$$\frac{4/3\,\pi(2)^3(x+2)\cancel{(x+2)}\cancel{(x+2)}}{1/3\,\cancel{(x+2)}\cancel{(x+2)}(x+1)} = \boxed{\frac{32\pi(x+2)}{(x+1)}}$$

Find the roots.

20. $12x^2 - 4x = 40$

$12x^2 - 4x - 40 = 0$

$4(3x^2 - x - 10) = 0$

$4(3x+5)(x-2) = 0$

$x = -5/3 \quad x = 2$

21. $49x^2 - 16 = 0$

$(7x+4)(7x-4) = 0$

$x = \frac{-4}{7} \quad x = \frac{4}{7}$

22. $14x^2 - 21x = 0$

$7x(2x-3) = 0$

$x = 0 \quad x = 3/2$

22. $-x^2 = 6x - 10$

$x^2 + 6x - 10 = 0$

$x = \frac{-6 \pm \sqrt{(36) - 4(1)(-10)}}{2(1)}$

$x = \frac{-6 \pm \sqrt{76}}{2} = \frac{-6 \pm 2\sqrt{19}}{2} = \boxed{-3 \pm \sqrt{19}}$

23. $3 - 8x - 5x^2 = 2x$

$5x^2 + 10x - 3 = 0$

$x = \frac{-10 \pm \sqrt{100 - 4(5)(-3)}}{2(5)}$

$x = \frac{-10 \pm \sqrt{160}}{10} = \frac{-10 \pm 4\sqrt{10}}{10} = \frac{-5 \pm 2\sqrt{10}}{5}$

24. $7x - 5 + 12x^2 = -3x$

$12x^2 + 10x - 5 = 0$

$x = \frac{-10 \pm \sqrt{100 - 4(12)(-5)}}{2(12)}$

$x = \frac{-10 \pm \sqrt{340}}{24}$

$x = \frac{-10 \pm 2\sqrt{85}}{24} = \frac{-5 \pm \sqrt{85}}{12}$