

Name _____

Simplify the following rational expressions.

1) $\frac{x+1}{x^2-7x-18} \div \frac{7x^2}{7x^3+14x^2}$

$$\frac{x+1}{x-9}$$

2) $\frac{3x^2+18x}{x^2+x-30}$

$$\frac{3x}{x-5}$$

3) $\frac{x^2+6x+5}{6x+6} \cdot \frac{x-6}{5x^2+25x} \cdot \frac{15x-30}{3}$

$$\frac{(x-6)(x-2)}{6x}$$

4) $\frac{x}{x+3} + \frac{2x+6}{x^2+6x+9}$

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

5) $\frac{2x^2+64}{x^2-64} - \frac{x-4}{x+8}$

$$\frac{x+4}{x-8}$$

6) $\frac{2}{y+3} - \frac{y}{y-1} + \frac{y^2+2}{y^2+2y-3}$

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

7) $\frac{\frac{x}{x+2}}{2x+\frac{x}{5}}$

$$\frac{5}{11(x+2)}$$

8) $\frac{\frac{x^2+8x+15}{x^2+x-6}}{\frac{x^2+2x-15}{x^2-2x-3}}$

$$\frac{x+1}{x-2}$$

9) $\frac{4x^4}{x^5y} \div \frac{2x^3}{6y^3} \cdot \frac{10x^3y}{12y^7}$

$$\frac{10}{xy^4}$$

Solve and check for extraneous solutions.

10) $x - \frac{6}{x} = 5$

$$6, -1$$

11) $\frac{2}{d+2} + \frac{8}{d-2} = \frac{14}{d^2-4}$

$$d = \frac{1}{5}$$

12) $\frac{4}{x^2-4} = \frac{1}{x-2}$

NO sol.

Find the characteristics listed of the rational function. List the transformation.

$$13) f(x) = -\frac{2}{x+5} - 1$$

Vertical Asymptote: $x = -5$

Horizontal Asymptote: $y = -1$

Domain: $(-\infty, -5) \cup (-5, \infty)$

Range: $(-\infty, -1) \cup (-1, \infty)$

$$14) f(x) = \frac{1}{x} + 6$$

Vertical Asymptote: $x = 0$

Horizontal Asymptote: $y = 6$

Domain: $(-\infty, 0) \cup (0, \infty)$

Range: $(-\infty, 6) \cup (6, \infty)$

15) Write a rational function with a hole located at $x = -3$, vertical asymptotes at $x = 4$, zero of $x = \frac{2}{3}$, and horizontal asymptote of $y = 3$.

$$f(x) = \frac{3x^2 + 7x - 4}{x^2 - x - 12}$$

16) Hole located at $x = 0$, vertical asymptotes at $x = 2$ and $x = -9$

$$f(x) = \frac{x}{x^3 + 7x^2 - 18x}$$

Find the characteristics of each rational function.

$$17) f(x) = \frac{2x^2 - 5x - 3}{x^2 + 4x - 21}$$

$$18) f(x) = \frac{x^2 + 6x + 5}{x - 2}$$

$$19) f(x) = \frac{x}{x^2 - 9}$$

VA $x = -7$

HA $y = 2$

SA ---

Zeros $x = -1/2$

Holes $x = 3$

VA $x = 2$

HA ---

SA $y = x + 8$

Zeros $x = -5, -1$

Holes None

VA $x = \pm 3$

HA $y = 0$

SA ---

Zeros $x = 0$

Holes None

SHOW ALL WORK.

20) The force needed to keep a car from skidding on a curve varies directly as the weight of the car and the square of the speed and inversely as the radius of the curve. Suppose a 4,000 lb. force is required to keep a 2,700 lb. car traveling at 25 mph from skidding on a curve of radius 510 ft. How much force is required to keep a 3,000 lb. car traveling at 45 mph from skidding on a curve of radius 400 ft.?

$$F = 18,360$$

21) The price, P, of a pizza varies directly as the square root of its radius, R. If the price is \$12.50 for a pizza with a 6 inch radius, what is the radius of a pizza that costs \$18.25?

$$\$12.79$$

22) Assume that the number of bacteria in a bacterial culture doubles every hour and that there are 1,000 present initially. How many bacteria are present after 8 hours and 15 minutes?

$$y = 1000(2)^{8.25}$$
$$304,437.02$$

23) The population of a town is 100,000 and increasing at the rate of 2.5% per year. How many people are present after 10 years? When will the population have doubled?

$$\downarrow$$
$$129,008$$

$$\downarrow$$
$$\log_{1.025}(2) = 28.1 \text{ years}$$

24) If you invest \$5,000 in a bank giving 6% interest for 10 years, how much money will you have if the interest is compounded: a. annually, b. monthly, c. continuously?

$$\begin{array}{ccc} \downarrow & & \downarrow \\ \$ 8954.24 & & \$ 9110.59 \\ & \downarrow & \\ & \$ 9096.98 & \end{array}$$

25) If you invest \$5,000 in a bank with 6% interest compounded monthly, how long before the investment triples?

$$19.36 \text{ years}$$

26) How much do you need to invest in a bank giving 6% interest compounded annually to have \$25,000 after 10 years?

\$ 13,959.87

27) What annual interest rate do you need to triple your investment if you leave the money from problem #5 in the account for 20 years?

5.6%

28) At a high school with 1,024 students, 16 students have colds on September 1, and the number of students with colds doubles every 11 days. When was half the student body affected?

55 days

29) A given population decreases according to the equation $P(t) = 532 - 14e^{0.25t}$ where t is in years. What is the initial population and how many years will it take for the population to reach 0?

↓
518

↓
14.55 years

30) Delores borrowed \$300 from Draco four months ago. Today Delores paid Draco back \$450. What is the annual interest rate Delores paid?

237.5%