

A.APR.D.6: Rational Expressions 3

- 1 Given $x \neq -2$, the expression $\frac{2x^2 + 5x + 8}{x + 2}$ is equivalent to

1) $2x^2 + \frac{9}{x+2}$

3) $2x + 1 + \frac{6}{x+2}$

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

4) $2x + 9 - \frac{10}{x+2}$

- 2 Given $f(x) = 2x^3 - 3x^2 - 5x - 12$ and $g(x) = x - 3$, the quotient of $\frac{f(x)}{g(x)}$ is

1) $2x^2 + 3x + 4$

3) $2x^2 - 9x + 22 - \frac{78}{x-3}$

2) $2x^3 + 3x^2 + 4x$

4) $2x^3 - 9x^2 + 22x - 78$

- 3 The expression $\frac{x^3 + 2x^2 + x + 6}{x + 2}$ is equivalent to

1) $x^2 + 3$

3) $2x^2 + x + 6$

2) $x^2 + 1 + \frac{4}{x+2}$

4) $2x^2 + 1 + \frac{4}{x+2}$

- 4 Given $x \neq -3$, which expression is equivalent to $\frac{2x^3 + 3x^2 - 4x + 5}{x + 3}$?

1) $2x^3 + 9x^2 + 23x + 74$

3) $2x^3 - 3x^2 + 5x - 10$

2) $2x^2 - 3x + 5 - \frac{10}{x+3}$

4) $2x^2 + 9x + 23 + \frac{74}{x+3}$

- 5 Given $x \neq -3$, the expression $\frac{2x^3 + 7x^2 - 3x - 25}{x + 3}$ is equivalent to

1) $2x^2 + x - 6 - \frac{7}{x+3}$

3) $2x^2 + x - 13$

2) $2x^2 + 13x - 36 + \frac{83}{x+3}$

4) $x^2 + 4x - 15 + \frac{20}{x+3}$

- 6 Which expression is equivalent to $\frac{2x^4 + 8x^3 - 25x^2 - 6x + 14}{x + 6}$?

1) $2x^3 + 4x^2 + x - 12 + \frac{86}{x+6}$

3) $2x^3 - 4x^2 - x + \frac{14}{x+6}$

2) $2x^3 - 4x^2 - x + 14$

4) $2x^3 - 4x^2 - x$

- 7 Which expression is equivalent to $\frac{x^3 - 2}{x - 2}$?

1) x^2

3) $x^2 - 2$

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

4) $x^2 - 2x + 4 - \frac{10}{x-2}$

- 8 The expression $\frac{x^4 - 5x^2 + 4x + 14}{x + 2}$ is equivalent to
- 1) $x^3 - 2x^2 - x + 6 + \frac{2}{x + 2}$
 - 2) $x^3 - 5x + 4 - \frac{14}{x + 2}$
 - 3) $x^3 + 2x^2 - x + 2 + \frac{18}{x + 2}$
 - 4) $x^3 + 2x^2 - 9x + 22 - \frac{30}{x + 2}$
- 9 The rational expression $\frac{2x^4 - 5x^2 + 3x - 2}{x - 3}$ is equivalent to
- 1) $2x^3 - 5x - 12 - \frac{38}{x - 3}$
 - 2) $2x^3 + 6x^2 + 13x + 42 + \frac{124}{x - 3}$
 - 3) $2x^3 - 5x + 18 - \frac{56}{x - 3}$
 - 4) $2x^3 - 6x^2 + 13x - 36 + \frac{106}{x - 3}$
- 10 Which expression is equivalent to $\frac{6x^4 + 4x^3 + x + 200}{x + 2}$?
- 1) $6x^2 - 8x + 17 + \frac{166}{x + 2}$
 - 2) $6x^2 + 16x + 33 + \frac{266}{x + 2}$
 - 3) $6x^3 + 16x^2 + 32x + 65 + \frac{330}{x + 2}$
 - 4) $6x^3 - 8x^2 + 16x - 31 + \frac{262}{x + 2}$
- 11 What is the quotient when $10x^3 - 3x^2 - 7x + 3$ is divided by $2x - 1$?
- 1) $5x^2 + x + 3$
 - 2) $5x^2 - x + 3$
 - 3) $5x^2 - x - 3$
 - 4) $5x^2 + x - 3$
- 12 The expression $\frac{6x^3 + 17x^2 + 10x + 2}{2x + 3}$ equals
- 1) $3x^2 + 4x - 1 + \frac{5}{2x + 3}$
 - 2) $6x^2 + 8x - 2 + \frac{5}{2x + 3}$
 - 3) $6x^2 - x + 13 - \frac{37}{2x + 3}$
 - 4) $3x^2 + 13x + \frac{49}{2} + \frac{151}{2x + 3}$
- 13 The expression $\frac{9x^2 - 2}{3x + 1}$ is equivalent to
- 1) $3x - 1 - \frac{1}{3x + 1}$
 - 2) $3x - 1 + \frac{1}{3x + 1}$
 - 3) $3x + 1 - \frac{1}{3x + 1}$
 - 4) $3x + 1 + \frac{1}{3x + 1}$
- 14 Which expression is equivalent to $\frac{2x^3 + 2x - 7}{2x + 4}$?
- 1) $x^2 - 2x + 5 - \frac{27}{2x + 4}$
 - 2) $x^2 - 1 - \frac{3}{2x + 4}$
 - 3) $x^2 + 2x + 5 + \frac{13}{2x + 4}$
 - 4) $x^2 + 2x - 3 + \frac{5}{2x + 4}$

15 Which expression is equivalent to $\frac{4x^3 + 9x - 5}{2x - 1}$, where $x \neq \frac{1}{2}$?

1) $2x^2 + x + 5$

3) $2x^2 - x + 5$

2) $2x^2 + \frac{11}{2} + \frac{1}{2(2x - 1)}$

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

16 The expression $\frac{4x^3 + 5x + 10}{2x + 3}$ is equivalent to

1) $2x^2 + 3x - 7 + \frac{31}{2x + 3}$

3) $2x^2 + 2.5x + 5 + \frac{15}{2x + 3}$

2) $2x^2 - 3x + 7 - \frac{11}{2x + 3}$

4) $2x^2 - 2.5x - 5 - \frac{20}{2x + 3}$

17 Given $f(x) = 3x^2 + 7x - 20$ and $g(x) = x - 2$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

18 Determine the quotient and remainder when $(6a^3 + 11a^2 - 4a - 9)$ is divided by $(3a - 2)$. Express your answer in the form $q(a) + \frac{r(a)}{d(a)}$.

19 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

Is $x = 4$ a root of $f(x)$? Explain your answer.

20 Given $a(x) = x^4 + 2x^3 + 4x - 10$ and $b(x) = x + 2$, determine $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$. Is $b(x)$ a factor of $a(x)$?

Explain.

21 When the function $p(x)$ is divided by $x - 1$ the quotient is $x^2 + 7 + \frac{5}{x - 1}$. State $p(x)$ in standard form.

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Answer Section

1 ANS: 3

$$\begin{array}{r} 2x + 1 \\ x + 2 \end{array) 2x^2 + 5x + 8}$$

$$\underline{2x^2 + 4x}$$

$$x + 8$$

$$\underline{x + 2}$$

$$6$$

REF: 012007aii

2 ANS: 1

$$\begin{array}{r} 2x^2 + 3x + 4 \\ x - 3 \end{array) 2x^3 - 3x^2 - 5x - 12}$$

$$\underline{2x^3 - 6x^2}$$

$$3x^2 - 5x$$

$$\underline{3x^2 - 9x}$$

$$4x - 12$$

$$\underline{4x - 12}$$

$$0$$

REF: 012505aii

3 ANS: 2

$$\begin{array}{r} x^2 + 0x + 1 \\ x + 2 \end{array) x^3 + 2x^2 + x + 6}$$

$$\underline{x^3 + 2x^2}$$

$$0x^2 + x$$

$$\underline{0x^2 + 0x}$$

$$x + 6$$

$$\underline{x + 2}$$

$$4$$

REF: 081611aii

4 ANS: 2

$$\begin{array}{r} 2x^2 - 3x + 5 \\ x + 3 \) 2x^3 + 3x^2 - 4x + 5 \end{array}$$

$$\underline{2x^3 + 6x^2}$$

$$- 3x^2 - 4x$$

$$\underline{-3x^2 - 9x}$$

$$5x + 5$$

$$\underline{5x + 15}$$

$$- 10$$

REF: 082302aii

5 ANS: 1

$$\begin{array}{r} 2x^2 + x - 6 \\ x + 3 \) 2x^3 + 7x^2 - 3x - 25 \end{array}$$

$$\underline{2x^3 + 6x^2}$$

$$x^2 - 3x$$

$$\underline{x^2 + 3x}$$

$$- 6x - 25$$

$$\underline{-6x - 18}$$

$$- 7$$

REF: 062203aii

6 ANS: 3

$$\begin{array}{r} 2x^3 - 4x^2 - x + \frac{14}{x + 6} \\ x + 6 \) 2x^4 + 8x^3 - 25x^2 - 6x + 14 \end{array}$$

$$\underline{2x^4 + 12x^3}$$

$$- 4x^3 - 25x^2$$

$$\underline{-4x^3 - 24x^2}$$

$$- x^2 - 6x$$

$$\underline{-x^2 - 6x}$$

REF: 081805aii

7 ANS: 2

$$\begin{array}{r} x^2 + 2x + 4 \\ x - 2 \) x^3 - 0x^2 + 0x - 2 \\ \underline{x^3 - 2x^2} \end{array}$$

$$2x^2 + 0x$$

$$\underline{2x^2 - 4x}$$

$$4x - 2$$

$$\underline{4x - 8}$$

$$6$$

REF: 082217aii

8 ANS: 1

$$\begin{array}{r} x^3 - 2x^2 - x + 6 \\ x + 2 \) x^4 + 0x^3 - 5x^2 + 4x + 14 \\ \underline{x^4 + 2x^3} \end{array}$$

$$\underline{-2x^3 - 5x^2}$$

$$\underline{-2x^3 - 4x^2}$$

$$-x^2 + 4x$$

$$\underline{-x^2 - 2x}$$

$$6x + 14$$

$$\underline{6x + 12}$$

$$2$$

REF: 012305aii

9 ANS: 2

$$\begin{array}{r} 2x^3 + 6x^2 + 13x + 42 \\ x - 3 \end{array} \overline{) 2x^4 + 0x^3 - 5x^2 + 3x - 2}$$

$$\underline{2x^4 - 6x^3}$$

$$6x^3 - 5x^2$$

$$\underline{6x^3 - 18x^2}$$

$$13x^2 + 3x$$

$$\underline{13x^2 - 39x}$$

$$42x - 2$$

$$\underline{42x - 126}$$

$$124$$

REF: 012408aii

10 ANS: 4

$$\begin{array}{r} 6x^3 - 8x^2 + 16x - 31 \\ x + 2 \end{array} \overline{) 6x^4 + 4x^3 + 0x^2 + x + 200}$$

$$\underline{6x^4 + 12x^3}$$

$$- 8x^3 + 0x^2$$

$$\underline{- 8x^3 - 16x^2}$$

$$16x^2 + x$$

$$\underline{16x^2 + 32x}$$

$$- 31x + 200$$

$$\underline{- 31x - 62}$$

$$262$$

REF: 082407aii

11 ANS: 4

$$\frac{5x^2 + x - 3}{2x - 1} \overline{)10x^3 - 3x^2 - 7x + 3}$$

$$\underline{10x^3 - 5x^2}$$

$$2x^2 - 7x$$

$$\underline{2x^2 - x}$$

$$-6x + 3$$

$$\underline{-6x + 3}$$

REF: 011809aii

12 ANS: 1

$$\begin{array}{r} 3x^2 + 4x - 1 \\ 2x + 3 \overline{)6x^3 + 17x^2 + 10x + 2} \\ 6x^3 + 9x^2 \\ \hline 8x^2 + 10x \\ 8x^2 + 12x \\ \hline -2x + 2 \\ -2x - 3 \\ \hline 5 \end{array}$$

REF: fall1503aii

13 ANS: 1

$$\frac{3x - 1}{3x + 1} \overline{)9x^2 + 0x - 2}$$

$$\underline{9x^2 + 3x}$$

$$-3x - 2$$

$$\underline{-3x - 1}$$

$$-1$$

REF: 081910aii

14 ANS: 1

$$\begin{array}{r} x^2 - 2x + 5 \\ \hline 2x + 4 \end{array) 2x^3 + 0x^2 + 2x - 7}$$

$$\underline{2x^3 + 4x^2}$$

$$- 4x^2 + 2x$$

$$\underline{-4x^2 - 8x}$$

$$10x - 7$$

$$\underline{10x + 20}$$

$$- 27$$

REF: 062313aii

15 ANS: 1

$$\begin{array}{r} 2x^2 + x + 5 \\ \hline 2x - 1 \end{array) 4x^3 + 0x^2 + 9x - 5}$$

$$\underline{4x^3 - 2x^2}$$

$$2x^2 + 9x$$

$$\underline{2x^2 - x}$$

$$10x - 5$$

$$\underline{10x - 5}$$

REF: 081713aii

16 ANS: 2

$$\begin{array}{r} 2x^2 - 3x + 7 \\ \hline 2x + 3 \end{array) 4x^3 + 0x^2 + 5x + 10}$$

$$\underline{4x^3 + 6x^2}$$

$$- 6x^2 + 5x$$

$$\underline{-6x^2 - 9x}$$

$$14x + 10$$

$$\underline{14x + 21}$$

$$- 11$$

REF: 061614aii

17 ANS:

$$\begin{array}{r} 3x + 13 \\ x - 2 \overline{) 3x^2 + 7x - 20} & 3x + 13 + \frac{6}{x - 2} \\ \underline{3x^2 - 6x} & \\ 13x - 20 & \\ \underline{13x - 26} & \\ 6 & \end{array}$$

REF: 011732aii

18 ANS:

$$\begin{array}{r} 2a^2 + 5a + 2 \\ 3a - 2 \overline{) 6a^3 + 11a^2 - 4a - 9} & 2a^2 + 5a + 2 - \frac{5}{3a - 2} \\ \underline{6a^3 - 4a^2} & \\ 15a^2 - 4a & \\ \underline{15a^2 - 10a} & \\ 6a - 9 & \\ \underline{6a - 4} & \\ - 5 & \end{array}$$

REF: 061829aii

19 ANS:

$$\begin{array}{r} 3x^2 + 8x + 34 \\ x - 4 \overline{) 3x^3 - 4x^2 + 2x - 1} & 3x^2 + 8x + 34 + \frac{135}{x - 4} \quad x = 4 \text{ is not a root of } f(x) \text{ because } \frac{f(x)}{g(x)} \text{ has a remainder.} \\ \underline{3x^3 - 12x^2} & \\ 8x^2 + 2x & \\ \underline{8x^2 - 32x} & \\ 34x - 1 & \\ \underline{34x - 136} & \\ 135 & \end{array}$$

REF: 082235aii

20 ANS:

$$x+2 \overline{)x^4 + 2x^3 + 4x - 10} \quad x^3 + 4 - \frac{18}{x+2}. \text{ No, because there is a remainder.}$$

$$\underline{x^4 + 2x^3}$$

$$4x - 10$$

$$\underline{4x + 8}$$

$$- 18$$

REF: 011934aii

21 ANS:

$$\frac{p(x)}{x-1} = x^2 + 7 + \frac{5}{x-1}$$

$$p(x) = x^3 - x^2 + 7x - 7 + 5$$

$$p(x) = x^3 - x^2 + 7x - 2$$

REF: 061930aii