

## F.BF.A.1: Operations with Functions

- For all real values of  $x$ , if  $f(x) = (x - 3)^2$  and  $g(x) = (x + 3)^2$ , what is  $f(x) - g(x)$ ?
  - 18
  - 0
  - 12x
  - $2x^2 - 12x - 18$
- Functions  $f$  and  $g$  are given below.
 
$$f(x) = \frac{7}{2}x^2 - 5x + 11$$

$$g(x) = 3x^2 - 7x + 25$$
 When  $2f(x)$  is subtracted from  $g(x)$ , the result is
  - $4x^2 - 3x - 3$
  - $-4x^2 + 3x + 3$
  - $4x^2 - 17x - 47$
  - $-4x^2 - 17x + 47$
- If  $f(x) = x^2 + 9$  and  $g(x) = x + 3$ , which operation would not result in a polynomial expression?
  - $f(x) + g(x)$
  - $f(x) - g(x)$
  - $f(x) \bullet g(x)$
  - $f(x) \div g(x)$
- If  $g(c) = 1 - c^2$  and  $m(c) = c + 1$ , then which statement is *not* true?
  - $g(c) \cdot m(c) = 1 + c - c^2 - c^3$
  - $g(c) + m(c) = 2 + c - c^2$
  - $m(c) - g(c) = c + c^2$
  - $\frac{m(c)}{g(c)} = \frac{-1}{1 - c}$
- If  $p(x) = ab^x$  and  $r(x) = cd^x$ , then  $p(x) \bullet r(x)$  equals
  - $ac(b + d)^x$
  - $ac(b + d)^{2x}$
  - $ac(bd)^x$
  - $ac(bd)^{x^2}$
- Given  $f(x) = 2x^2 + 7x - 15$  and  $g(x) = 3 - 2x$ , what is  $\frac{f(x)}{g(x)}$  for all defined values?
  - $-x - 5$
  - $-x + 5$
  - $x - 5$
  - $x + 5$
- The volume of a cardboard box can be modeled by  $V(x)$ , which is the product of the length, width, and height,  $x$ . If the length can be represented by  $L(x) = 18 - 2x$  and the width can be represented by  $W(x) = 18 - 2x$ , then which function represents  $V(x)$ ?
  - $V(x) = 4x^2 - 72x + 324$
  - $V(x) = 4x^3 - 72x^2 + 324x$
  - $V(x) = -3x + 36$
  - $V(x) = 4x^3 + 324x$
- Chet has \$1200 invested in a bank account modeled by the function  $P(n) = 1200(1.002)^n$ , where  $P(n)$  is the value of his account, in dollars, after  $n$  months. Chet's debt is modeled by the function  $Q(n) = 100n$ , where  $Q(n)$  is the value of debt, in dollars, after  $n$  months. After  $n$  months, which function represents Chet's net worth,  $R(n)$ ?
  - $R(n) = 1200(1.002)^n + 100n$
  - $R(n) = 1200(1.002)^{12n} + 100n$
  - $R(n) = 1200(1.002)^n - 100n$
  - $R(n) = 1200(1.002)^{12n} - 100n$
- The revenue,  $R(x)$ , from selling  $x$  units of a product is represented by the equation  $R(x) = 35x$ , while the total cost,  $C(x)$ , of making  $x$  units of the product is represented by the equation  $C(x) = 20x + 500$ . The total profit,  $P(x)$ , is represented by the equation  $P(x) = R(x) - C(x)$ . For the values of  $R(x)$  and  $C(x)$  given above, what is  $P(x)$ ?
  - $15x$
  - $15x + 500$
  - $15x - 500$
  - $10x + 100$

- 10 A company produces  $x$  units of a product per month, where  $C(x)$  represents the total cost and  $R(x)$  represents the total revenue for the month. The functions are modeled by  $C(x) = 300x + 250$  and  $R(x) = -0.5x^2 + 800x - 100$ . The profit is the difference between revenue and cost where  $P(x) = R(x) - C(x)$ . What is the total profit,  $P(x)$ , for the month?
- 1)  $P(x) = -0.5x^2 + 500x - 150$                       3)  $P(x) = -0.5x^2 - 500x + 350$   
 2)  $P(x) = -0.5x^2 + 500x - 350$                       4)  $P(x) = -0.5x^2 + 500x + 350$
- 11 Stone Manufacturing has developed a cost model,  $C(x) = 0.18x^3 + 0.02x^2 + 4x + 180$ , where  $x$  is the number of sprockets sold, in thousands. The sales price can be modeled by  $S(x) = 95.4 - 6x$  and the company's revenue by  $R(x) = x \bullet S(x)$ . The company's profits,  $R(x) - C(x)$ , could be modeled by
- 1)  $0.18x^3 + 6.02x^2 + 91.4x + 180$                       3)  $-0.18x^3 - 6.02x^2 + 91.4x - 180$   
 2)  $0.18x^3 - 5.98x^2 - 91.4x + 180$                       4)  $0.18x^3 + 5.98x^2 + 99.4x + 180$
- 12 A manufacturing company has developed a cost model,  $C(x) = 0.15x^3 + 0.01x^2 + 2x + 120$ , where  $x$  is the number of items sold, in thousands. The sales price can be modeled by  $S(x) = 30 - 0.01x$ . Therefore, revenue is modeled by  $R(x) = x \bullet S(x)$ . The company's profit,  $P(x) = R(x) - C(x)$ , could be modeled by
- 1)  $0.15x^3 + 0.02x^2 - 28x + 120$                       3)  $-0.15x^3 + 0.01x^2 - 2.01x - 120$   
 2)  $-0.15x^3 - 0.02x^2 + 28x - 120$                       4)  $-0.15x^3 + 32x + 120$
- 13 The profit function,  $p(x)$ , for a company is the cost function,  $c(x)$ , subtracted from the revenue function,  $r(x)$ . The profit function for the Acme Corporation is  $p(x) = -0.5x^2 + 250x - 300$  and the revenue function is  $r(x) = -0.3x^2 + 150x$ . The cost function for the Acme Corporation is
- 1)  $c(x) = 0.2x^2 - 100x + 300$                       3)  $c(x) = -0.2x^2 + 100x - 300$   
 2)  $c(x) = 0.2x^2 + 100x + 300$                       4)  $c(x) = -0.8x^2 + 400x - 300$
- 14 The profit function,  $p(x)$ , is found by subtracting the cost function,  $c(x)$ , from the revenue function,  $r(x)$ . Which function below represents the cost function given  $p(x) = -15x^2 + 600x + 60$  and  $r(x) = -0.4x^2 + 130x + 1200$ ?
- 1)  $c(x) = -14.6x^2 + 470x - 1140$                       3)  $c(x) = 14.6x^2 - 470x + 1140$   
 2)  $c(x) = -14.6x^2 + 730x - 1260$                       4)  $c(x) = 14.6x^2 + 730x - 1260$
- 15 Given that  $f(x) = 2x + 1$ , find  $g(x)$  if  $g(x) = 2[f(x)]^2 - 1$ .
- 16 Given:  $f(x) = 2x^2 + x - 3$  and  $g(x) = x - 1$   
 Express  $f(x) \bullet g(x) - [f(x) + g(x)]$  as a polynomial in standard form.
- 17 Write the expression  $A(x) \bullet B(x) - 3C(x)$  as a polynomial in standard form.
- $$A(x) = x^3 + 2x - 1$$
- $$B(x) = x^2 + 7$$
- $$C(x) = x^4 - 5x$$
- 18 A company calculates its profit by finding the difference between revenue and cost. The cost function of producing  $x$  hammers is  $C(x) = 4x + 170$ . If each hammer is sold for \$10, the revenue function for selling  $x$  hammers is  $R(x) = 10x$ . How many hammers must be sold to make a profit? How many hammers must be sold to make a profit of \$100?

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### Answer Section

1 ANS: 3

$$x^2 - 6x + 9 - (x^2 + 6x + 9) = -12x$$

REF: 062210aai

2 ANS: 2

$$3x^2 - 7x + 25 - (7x^2 - 10x + 22) = -4x^2 + 3x + 3$$

REF: 012513aai

3 ANS: 4

REF: 081803aai

4 ANS: 4

$$\frac{m(c)}{g(c)} = \frac{c+1}{1-c^2} = \frac{c+1}{(1+c)(1-c)} = \frac{1}{1-c}$$

REF: 061608aai

5 ANS: 3

REF: 011710aai

6 ANS: 1

$$\frac{f(x)}{g(x)} = \frac{2x^2 + 7x - 15}{3 - 2x} = \frac{(2x-3)(x+5)}{-(2x-3)} = \frac{x+5}{-1} = -x-5$$

REF: 012412aai

7 ANS: 2

$$V(x) = x(18-2x)(18-2x) = x(324-72x+4x^2) = 324x-72x^2+4x^3$$

REF: 082418aai

8 ANS: 3

REF: 012002aai

9 ANS: 3

$$\begin{aligned} P(x) &= R(x) - C(x) \\ &= 35x - (20x + 500) \\ &= 15x - 500 \end{aligned}$$

REF: 010220b

10 ANS: 2

$$P(x) = -0.5x^2 + 800x - 100 - (300x + 250) = -0.5x^2 + 500x - 350$$

REF: 081406ai

11 ANS: 3

$$95.4x - 6x^2 - (0.18x^3 + 0.02x^2 + 4x + 180)$$

REF: 082322aai

12 ANS: 2

$$\begin{aligned}
 x(30 - 0.01x) - (0.15x^3 + 0.01x^2 + 2x + 120) &= 30x - 0.01x^2 - 0.15x^3 - 0.01x^2 - 2x - 120 \\
 &= -0.15x^3 - 0.02x^2 + 28x - 120
 \end{aligned}$$

REF: 061709aaii

13 ANS: 1

$$\begin{aligned}
 p(x) &= r(x) - c(x) \\
 -0.5x^2 + 250x - 300 &= -0.3x^2 + 150x - c(x) \\
 c(x) &= 0.2x^2 - 100x + 300
 \end{aligned}$$

REF: 061813aaii

14 ANS: 3

$$\begin{aligned}
 p(x) &= r(x) - c(x) \\
 -15x^2 + 600x + 60 &= -0.4x^2 + 130x + 1200 - c(x) \\
 c(x) &= 14.6x^2 - 470x + 1140
 \end{aligned}$$

REF: 062421aaii

15 ANS:

$$g(x) = 2(2x + 1)^2 - 1 = 2(4x^2 + 4x + 1) - 1 = 8x^2 + 8x + 2 - 1 = 8x^2 + 8x + 1$$

REF: 061625ai

16 ANS:

$$\begin{aligned}
 &\left(2x^2 + x - 3\right) \bullet (x - 1) - \left[\left(2x^2 + x - 3\right) + (x - 1)\right] \\
 &\left(2x^3 - 2x^2 + x^2 - x - 3x + 3\right) - \left(2x^2 + 2x - 4\right) \\
 &2x^3 - 3x^2 - 6x + 7
 \end{aligned}$$

REF: 011833aaii

17 ANS:

$$\begin{aligned}
 &\left(x^3 + 2x - 1\right)\left(x^2 + 7\right) - 3\left(x^4 - 5x\right) \\
 &x^5 + 7x^3 + 2x^3 + 14x - x^2 - 7 - 3x^4 + 15x \\
 &x^5 - 3x^4 + 9x^3 - x^2 + 29x - 7
 \end{aligned}$$

REF: 012330aaii

18 ANS:

$$R(x) = C(x)$$

29, 45.  $10x = 4x + 170$ . If you round down to 28 hammers, the company does not make a profit. Round up to  $x = 28.3$

$$R(x) - C(x) = 100$$

29. To make a profit of \$100,  $10x - (4x + 170) = 100$   
 $6x - 170 = 100$   
 $x = 45$

REF: 080332b