

**Objectives:**

- Our goal is to learn how to add, subtract, and multiply functions.

Here are the functions we will use:

$$f(x) = 3x^2 + 5x - 4$$

$$g(x) = 5x^2 - 2x + 7$$

$$h(x) = 7x$$

$$k(x) = 2x + 1$$

$$m(x) = 3x - 4$$

$$p(x) = x^{\frac{1}{2}}$$

$$q(x) = 6x^{\frac{5}{3}}$$

$$w(x) = 2x^2 - 3$$

**Example Set 1:** Evaluate the following

<p>a. <math>f(2)</math></p> $f(x) = 3x^2 + 5x - 4$ $f(2) = 3(2)^2 + 5(2) - 4$ $= 12 + 10 - 4$ $f(2) = \boxed{18}$	<p>b. <math>-4k(3)</math></p> $k(x) = 2x + 1$ $-4 \cdot k(3)$ $-4 \cdot (2(3) + 1)$ $-4(7) = \boxed{-28}$	<p>c. <math>w(0) - p(4)</math></p> $w(x) = 2x^2 - 3$ $p(x) = x^{\frac{1}{2}}$ $w(0) = 2(0)^2 - 3 = -3$ $p(4) = 4^{\frac{1}{2}} = \sqrt{4} = 2$ $-3 - 2 = \boxed{-5}$
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**Example Set 2:** Perform each operation. Answers should be written in simplified form.

<p>a. <math>f(x) - m(x)</math></p> $f(x) = 3x^2 + 5x - 4$ $m(x) = 3x - 4$ $= (3x^2 + 5x - 4) - (3x - 4)$ $= 3x^2 + 5x - 4 - 3x + 4$ $= \boxed{3x^2 + 2x}$	<p>b. <math>(g + m)(x) = g(x) + m(x)</math></p> $5x^2 - 2x + 7 + 3x - 4$ $= \boxed{5x^2 + x + 3}$	<p>c. <math>(km)(x) = k(x) \cdot m(x)</math></p> $(2x + 1)(3x - 4)$ $6x^2 - 8x + 3x - 4$ $= \boxed{6x^2 - 5x - 4}$
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**Example Set 3:** Combining with complex numbers and exponents.

<p>a. Let <math>f(x) = 4 - i</math> and <math>g(x) = 3 - 2i</math></p> <p>Find <math>f(x) + g(x)</math></p> $4 - i + 3 - 2i$ $\boxed{7 - 3i}$ <p>Find <math>g(x) \cdot f(x)</math></p> $(3 - 2i)(4 - i)$ $12 - 3i - 8i + 2i^2$ $12 - 11i + 2(-1)$ $12 - 11i - 2$ $\boxed{10 - 11i}$	<p>b. Let <math>f(x) = 2x^{\frac{4}{5}}</math> and <math>g(x) = -5x^{\frac{1}{2}}</math></p> <p>Find <math>f(x) \cdot g(x)</math></p> $(2x^{\frac{4}{5}})(-5x^{\frac{1}{2}}) = 2 \cdot x^{\frac{4}{5}} \cdot -5 \cdot x^{\frac{1}{2}}$ $= 2 \cdot -5 \cdot x^{\frac{4}{5}} \cdot x^{\frac{1}{2}}$ $= -10x^{\frac{13}{10}}$ <p>Find <math>\frac{f(x)}{g(x)}</math></p> $\frac{2x^{\frac{4}{5}}}{-5x^{\frac{1}{2}}}$ $x^{\frac{4}{5} - \frac{1}{2}} = x^{\frac{8}{10} - \frac{5}{10}}$ $= x^{\frac{3}{10}}$ $\boxed{\frac{2x^{\frac{3}{10}}}{-5}}$
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**Practice Problems:** Use the following functions to answer the following questions.

$$f(x) = 3x^2 + 5x - 4$$

$$g(x) = 5x^2 - 2x + 7$$

$$h(x) = 7x$$

$$k(x) = 2x + 1$$

$$m(x) = 3x - 4$$

$$p(x) = x^{\frac{1}{2}}$$

$$q(x) = 6x^{\frac{5}{3}}$$

$$w(x) = 2x^2 - 3$$

<p><b>a.</b> <math>h(x) \cdot k(x)</math></p> $(7x)(2x + 1)$ $14x^2 + 7x$	<p><b>b.</b> <math>[k(x)]^2</math></p> $(2x + 1)(2x + 1)$ $4x^2 + 4x + 1$	<p><b>c.</b> <math>f(x) + g(x)</math></p> $(3x^2 + 5x - 4)$ $+ (5x^2 - 2x + 7)$ $8x^2 + 3x + 3$	<p><b>d.</b> <math>q(x)p(x)</math></p> $(6x^{5/3})(x^{1/2})$ $6x^{13/6}$
<p><b>e.</b> <math>f(x) - m(x)</math></p> $(3x^2 + 5x - 4)$ $- (3x - 4)$ $3x^2 + 2x$	<p><b>f.</b> <math>(gh)(x)</math></p> $(5x^2 - 2x + 7)(7x)$ $35x^3 - 14x^2 + 49x$	<p><b>g.</b> <math>m(x)m(x)</math></p> $(3x - 4)(3x - 4)$ $9x^2 - 24x + 16$	<p><b>h.</b> <math>w(x) - w(x)</math></p> $0$
<p><b>i.</b> <math>(wh)(x)</math></p> $(2x^2 - 3)(7x)$ $14x^3 - 21x$	<p><b>j.</b> <math>(g + m)(x)</math></p> $(5x^2 - 2x + 7)$ $+ (3x - 4)$ $5x^2 + x + 3$	<p><b>k.</b> <math>f(x)k(x)</math></p> $(3x^2 + 5x - 4)(2x + 1)$ $6x^3 + 13x^2 - 3x - 4$	<p><b>l.</b> <math>(p \cdot q)(x)</math></p> $(x^{1/2})(6x^{5/3})$ $6x^{13/6}$
<p><b>m.</b> <math>f(x) + f(x)</math></p> $(3x^2 + 5x - 4)$ $+ (3x^2 + 5x - 4)$ $6x^2 + 10x - 8$	<p><b>n.</b> <math>m(x) \cdot k(x)</math></p> $(3x - 4)(2x + 1)$ $6x^2 - 5x - 4$	<p><b>o.</b> <math>(h - k)(x)</math></p> $(7x) - (2x + 1)$ $5x - 1$	<p><b>p.</b> <math>p(x) \cdot k(x)</math></p> $(x^{1/2})(2x + 1)$ $2x^{3/2} + x^{1/2}$