10.2

1) $g(a) = a^3 + 5a^2$
$f(a) = 2a + 4$
$g(3) + f(3)$
$g(3) = 3^3 + 5(3)^2$
$g(3) = 27 + 5(9)$
$g(3) = 27 + 45$
$g(3) = 72$
$f(3) = 2(3) + 4$
$f(3) = 6 + 4$
$f(3) = 10$
$g(3) + f(3) = 72 + 10 = 82$

3) $g(a) = 3a + 3$
$f(a) = 2a - 2$
$(g + f)(a) = g(9) + f(9)$
$g(9) = 3(9) + 3$
$g(9) = 27 + 3$
$g(9) = 30$
$f(9) = 2(9) - 2$
$f(9) = 18 - 2$
$f(9) = 16$
$g(9) + f(9) = 30 + 16 = 46$

5) $g(x) = x + 3$
$f(x) = -x + 4$
$(g - f)(3) = g(3) - f(3)$
$g(3) = 3 + 3$
$g(3) = 6$
$f(3) = -3 + 4$
$f(3) = -1$
$g(3) + f(3) = 6 - 1 = 5$

7) $g(x) = x^2 + 2$
$f(x) = 2x + 5$
$(g - f)(0) = g(0) - f(0)$
$g(0) = 0^2 + 2$
$g(0) = 0 + 2$
$g(0) = 2$
$f(0) = 2(0) + 5$
$f(0) = 0 + 5$
$f(0) = 5$
$g(0) - f(0) = 2 - 5 = -3$

9) $g(t) = t - 3$
$h(t) = -3t^3 + 6t$
$g(1) + h(1)$
$g(1) = 1 - 3$
$g(1) = -2$
$h(1) = -3(1)^3 + 6(1)$
$h(1) = -3(1) + 6$
$h(1) = -3 + 6$
$h(1) = 3$
$g(1) + h(1) = -2 + 3 = 1$

11) $h(t) = t + 5$
$g(t) = 3t - 5$
$(h \cdot g)(5) = h(5) \cdot g(5)$
$h(5) = 5 + 5$
$h(5) = 10$
$g(5) = 3(5) - 5$
$g(5) = 15 - 5$
$g(5) = 10$
$h(5) \cdot g(5) = 10 \cdot 10 = 100$

13) $h(n) = 2n - 1$
$g(n) = 3n - 5$
$h(0) \div g(0)$
$h(0) = 2(0) - 1$
$h(0) = 0 - 1$
$h(0) = -1$
$g(0) = 3(0) - 5$
$g(0) = 0 - 5$
$g(0) = -5$
$h(0) \div g(0) = -1 \div -5 = -\frac{1}{5}$

15) $f(a) = -2a - 4$
$g(a) = a^2 + 3$
$\left(\frac{f}{g}\right)(7) = \frac{f(7)}{g(7)}$
$f(7) = -2(7) - 4$
$f(7) = -14 - 4$
$f(7) = -18$
$g(7) = 7^2 + 3$
$g(7) = 49 + 3$
$g(7) = 52$
$\frac{f(7)}{g(7)} = \frac{-18}{52} = -\frac{9}{26}$

17) $g(x) = -x^3 - 2$
$h(x) = 4x$
$(g - h)(x) = g(x) - h(x)$
$g(x) - h(x) = (-x^3 - 2) - (4x)$
$g(x) - h(x) = -x^3 - 2 - 4x$

19) $f(x) = -3x + 2$
$g(x) = x^2 + 5x$
$(f - g)(x) = f(x) - g(x)$
$f(x) - g(x) = (-3x + 2) - (x^2 + 5x)$
$f(x) - g(x) = -3x + 2 - x^2 - 5x$
$f(x) - g(x) = -x^2 - 8x + 2$

21) $g(x) = 4x + 5$
$h(x) = x^2 + 5x$
$g(x) \cdot h(x)$
$g(x) \cdot h(x) = (4x + 5)(x^2 + 5)$
$g(x) \cdot h(x) = 4x^3 + 20x^2 + 5x^2 + 25x$
$g(x) \cdot h(x) = 4x^3 + 25x^2 + 25$

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

25) $g(n) = n^2 + 5$
$f(n) = 3n + 5$
$g(n) \div f(n) = \frac{g(n)}{f(n)}$
$\frac{g(n)}{f(n)} = \frac{n^2+5}{3n+5}$

27) $g(a) = -2a + 5$
$f(a) = 3a + 5$
$\left(\frac{g}{f}\right)(a) = \frac{g(a)}{f(a)}$
$\frac{g(a)}{f(a)} = \frac{-2a+5}{3a+5}$

29) $h(n) = n^3 + 4n$
$g(n) = 4n + 5$
$h(n) + g(n)$
$h(n) + g(n) = (n^3 + 4n) + (4n + 5)$
$h(n) + g(n) = n^3 + 8n + 5$

31) $g(n) = n^2 - 4n$
$h(n) = n - 5$
$g(n^2) \cdot h(n^2)$
$g(n^2) \cdot h(n^2) = [(n^2)^2 - 4(n^2)][(n^2) - 5]$
$g(n^2) \cdot h(n^2) = (n^4 - 4n^2)(n^2 - 5)$
$g(n^2) \cdot h(n^2) = n^6 - 5n^4 - 4n^4 + 20n^2$
$g(n^2) \cdot h(n^2) = n^6 - 9n^4 + 20n^2$

33) $f(x) = 2x$
$g(x) = -3x - 1$
$(f + g)(-4 - x) = f(-4 - x) + g(-4 - x)$
$f(-4 - x) + g(-4 - x) = [2(-4 - x)] + [-3(-4 - x) - 1]$
$f(-4 - x) + g(-4 - x) = (-8 - 2x) + (12 + 3x - 1)$
$f(-4 - x) + g(-4 - x) = x + 3$

35) $f(t) = t^2 + 4t$
$g(t) = 4t + 2$
$f(t^2) + g(t^2)$
$f(t^2) + g(t^2) = [(t^4) + 4(t^2)] + [4(t^2) + 2]$
$f(t^2) + g(t^2) = t^4 + 8t^2 + 2$

37) $g(a) = a^3 + 2a$
$h(a) = 3a + 4$
$\left(\frac{g}{h}\right)(-x) = \frac{g(-x)}{h(-x)}$
$\frac{g(-x)}{h(-x)} = \frac{(-x)^3+2(x)}{3(x)+4} = \frac{-x^3-2x}{-3x+4}$

39) $f(n) = -3n^2 + 1$
$g(n) = 2n + 1$
$(f - g)\left(\frac{n}{3}\right) = f\left(\frac{n}{3}\right) - g\left(\frac{n}{3}\right)$
$f\left(\frac{n}{3}\right) - g\left(\frac{n}{3}\right) = \left[-3\left(\frac{n}{3}\right)^2 + 1\right] - \left[2\left(\frac{n}{3}\right) + 1\right]$
$f\left(\frac{n}{3}\right) - g\left(\frac{n}{3}\right) = \left[-3\left(\frac{n^2}{9}\right) + 1\right] - \left[\frac{2n}{3} + 1\right]$
$f\left(\frac{n}{3}\right) - g\left(\frac{n}{3}\right) = \left(-\frac{n^2}{3} + 1\right) - \frac{2n}{3} - 1$
$f\left(\frac{n}{3}\right) - g\left(\frac{n}{3}\right) = \frac{-n^2-2n}{3}$

41) $f(x) = -4x + 1$
$g(x) = 4x + 3$
$(f \circ g)(x) = f\big(g(9)\big)$
$g(9) = 4(9) + 3$
$g(9) = 36 + 3$
$g(9) = 39$
$f(39) = -4(39) + 1$
$f(39) = -156 + 1$
$f(39) = -155$

43) $h(a) = 3a + 3$
$g(a) = a + 1$
$(h \circ g)(5) = h\big(g(5)\big)$
$g(5) = 5 + 1$
$g(5) = 6$
$h(6) = 3(6) + 3$
$h(6) = 18 + 3$
$h(6) = 21$

45) $g(x) = x + 4$
$h(x) = x^2 - 1$
$(g \circ h)(10) = g\big(h(10)\big)$
$h(10) = 10^2 - 1$
$h(10) = 100 - 1$
$h(10) = 99$
$g(99) = 99 + 4$
$g(99) = 103$

47) $f(n) = -4n + 2$
$g(n) = n + 4$
$(f \circ g)(9) = f\big(g(9)\big)$
$g(9) = 9 + 4$
$g(9) = 13$
$f(13) = -4(13) + 2$
$f(13) = -52 + 2$
$f(13) = -50$

49) $g(x) = 2x - 4$
$h(x) = 2x^3 + 4x^2$
$(g \circ h)(3) = g\big(h(3)\big)$
$h(3) = 2(3^3) + 4(3^2)$
$h(3) = 2(27) + 4(9)$
$h(3) = 54 + 36$
$h(3) = 90$
$g(90) = 2(90) - 4$
$g(90) = 180 - 4$
$g(90) = 176$

51) $g(x) = x^2 - 5x$
$h(x) = 4x + 4$
$(g \circ h)(x) = g(h(x))$
$g(4x + 4) = (4x + 4)^2 - 5(4x + 4)$
$g(4x + 4) = 16x^2 + 32x + 16 - 20x - 20$
$g(4x + 4) = 16x^2 + 12x - 4$

53) $f(a) = -2a + 2$
$g(a) = 4a$
$(f \circ g)(a) = f\big(g(a)\big)$
$f(4a) = -2(4a) + 2$
$f(4a) = -8a + 2$

55) $g(x) = 4x + 4$
$f(x) = x^3 - 1$
$(g \circ f)(x) = g\big(f(x)\big)$
$g(x^3 - 1) = 4(x^3 - 1) + 4$
$g(x^3 - 1) = 4x^3 - 4 + 4$
$g(x^3 - 1) = 4x^3$

57) $g(x) = -x + 5$
$f(x) = 2x - 3$
$(g \circ f)(x) = g\big(f(x)\big)$
$g(2x - 3) = -(2x - 3) + 5$
$g(2x - 3) = -2x + 3 + 5$
$g(2x - 3) = -2x + 8$

59) $f(t) = 4t + 3$
$g(t) = -4t - 2$
$(f \circ g)(t) = f\big(g(t)\big)$
$f(-4t - 2) = 4(-4t - 2) + 3$
$f(-4t - 2) = -16t - 8 + 3$
$f(-4t - 2) = -16t - 5$