

# The Weekly Rigor

No. 191

“A mathematician is a machine for turning coffee into theorems.”

February 17, 2018

## 52 Problems in Calculating Composite Functions of Polynomials

(Part 2)

37. Let  $f(t) = -t + 7$  and  $g(t) = t^2 - 15$ . Find  $f(g(t))$ .
38. Let  $r(x) = x^3$  and  $s(x) = x - 7$ . Find  $s(r(2))$ .
39. Let  $V(s) = s^3$  and  $A(s) = 6s^2$ . Find  $V(A(s))$ .
40. Let  $P(t) = 3 + t - t^2$  and  $D(t) = t + 1$ . Find  $D(P(2))$ .
41. Let  $f(\theta) = 1 + \theta^2$ . Find  $f(f(\theta))$ .
42. Let  $f(x) = 2x$  and  $g(x) = \frac{1}{2}x$ . Find  $f(g(x))$ .
43. Let  $f(x) = 2x$  and  $g(x) = \frac{1}{2}x$ . Find  $g(f(x))$ .
44. Let  $f(x) = 2x$  and  $g(x) = \frac{1}{3}x$ . Find  $f(g(x))$ .
45. Let  $f(x) = 2x$  and  $g(x) = \frac{1}{3}x$ . Find  $g(f(x))$ .
46. Let  $f(x) = 2x + 1$  and  $g(x) = \frac{1}{2}x$ . Find  $f(g(x))$ .
47. Let  $f(x) = 2x + 1$  and  $g(x) = \frac{1}{2}x$ . Find  $g(f(x))$ .

48. Let  $f(x) = x + 1$ ,  $g(x) = x^2$ , and  $h(x) = x^3$ . Find  $f(g(h(x)))$ .
49. Let  $f(x) = x + 1$ ,  $g(x) = x^2$ , and  $h(x) = x^3$ . Find  $h(g(f(x)))$ .
50. Let  $f(x) = x + 1$ ,  $g(x) = x^2$ , and  $h(x) = x^3$ . Find  $f(h(g(x)))$ .
51. Let  $f(x) = x - 2$ ,  $g(x) = 3x + 5$ , and  $h(x) = -x$ . Find  $f(g(h(x)))$ .
52. Let  $f(x) = x$ ,  $g(x) = \frac{1}{2}x$ , and  $h(x) = 2x$ . Find  $f(g(h(x)))$ .

### ANSWERS

1. $x - 3$	14. $-3x^2 + 2$	27. $x + 2$	40. $2$
2. $x + 1$	15. $-x^2 + x + 4$	28. $x^4$	41. $\theta^4 + 2\theta^2 + 2$
3. $x - 1$	16. $x^2 + 4x + 4$	29. $-x^4 + 2x^2$	42. $x$
4. $x + 2$	17. $-9x^2 + 6x$	30. $-3$	43. $x$
5. $x^2 + 2x + 1$	18. $x$	31. $1$	44. $\frac{2}{3}x$
6. $x^4 + 6x^2 + 9$	19. $x^4$	32. $16$	45. $\frac{2}{3}x$
7. $-9x^2 + 6x$	20. $-x^4 + 2x^2$	33. $-10$	46. $x + 1$
8. $-x^2 - x + 3$	21. $-x^4 + 2x^3 + 4x^2 - 5x - 3$	34. $-2$	47. $x + \frac{1}{2}$
9. $x^2 + 2$	22. $x + 4$	35. $6$	48. $x^6 + 1$
10. $-3x^2 + 2$	23. $9x - 4$	36. $1$	49. $(x + 1)^6$
11. $x - 1$	24. $x + 2$	37. $-t^2 + 22$	50. $x^6 + 1$
12. $x^2 + 1$	25. $x^4 + 6x^2 + 12$	38. $1$	51. $-3x + 3$
13. $x^4 + 3$	26. $9x - 4$	39. $216s^6$	52. $x$

“Only he who never plays, never loses.”