01 도함수의 정의

미분가능한 함수 $y=f(x)$의 정의역의 각 원소 x에 미분계수 $f'(x)$를 대응시키면 새로운 함수

$$f'(x)=\lim_{\Delta x\to 0}\frac{f(x+\Delta x)-f(x)}{\Delta x}$$

를 얻는다. 이때 이 함수 $f'(x)$를 $f(x)$의 **도함수**라 한다.

◪ 도함수의 정의를 이용하여 다음 함수의 도함수를 구하여라.

1. $f(x)=4$

2. $f(x)=-5$

3. $f(x)=10$

4. $f(x)=x+3$

5. $f(x)=2x$

6. $f(x)=3x+4$

7. $f(x)=x^2-4$

8. $f(x)=x^2-3x$

9. $f(x)=x^2-5x$

10. $f(x)=4x^2$

11. $f(x)=x^4$

◪ 다음 함수의 도함수를 구하여라. 또, 이 도함수를 이용하여 각 함수의 $x=2$에서의 미분계수를 구하여라.

12. $f(x)=2x+5$

13. $f(x)=3x-7$

14. $f(x)=x^2$

15. $f(x)=x^2+2x$

16. $f(x)=x^2+x$

17. $f(x)=x^2-x$

02 미분법의 공식

(1) 함수 x^n과 상수함수의 도함수

① $y=x^n$ ($n\geq 2$인 정수) ⇨ $y'=nx^{n-1}$

② $y=x$ ⇨ $y'=1$

③ $y=c$ (c는 상수) ⇨ $y'=0$

(2) 함수의 실수배, 합, 차의 미분법

두 함수 $f(x)$, $g(x)$가 미분가능할 때,

① $\{cf(x)\}'=cf'(x)$ (단, c는 상수)

② $\{f(x)+g(x)\}'=f'(x)+g'(x)$

③ $\{f(x)-g(x)\}'=f'(x)-g'(x)$

(3) 곱의 미분법

① $\{f(x)g(x)\}'=f'(x)g(x)+f(x)g'(x)$

② $\{f(x)g(x)h(x)\}'$
$=f'(x)g(x)h(x)+f(x)g'(x)h(x)+f(x)g(x)h'(x)$

◪ 다음 함수를 미분하여라.

18. $y=-x^8$

19. $y=x^3$

20. $y=x^5$

21. $y=x^9$

22. $y=x^{10}$

23. $y=6$

24. $y=15$

25. $y=20$

26. $y=3x^6$

27. $y=2x+3$

28. $y=3x+2$

29. $y=-5x+2$

30. $y=-x^2+2x-4$

31. $y=-x^2+4x+3$

32. $y=-x^2+8x+5$

33. $y=\frac{1}{2}x^2-x+3$

34. $y=2x^3-4x^2+3x+1$

35. $y=\frac{1}{4}x^4+\frac{1}{3}x^3-\frac{1}{2}x^2-x$

36. $y=\frac{1}{5}x^5+\frac{1}{4}x^4+\frac{1}{3}x^3+\frac{1}{2}x^2+x$

◪ 함수 $f(x)$에 대하여 다음 값을 구하여라.

37. 함수 $f(x)=x^2+x+3$에 대하여 $f'(10)$의 값

38. 함수 $f(x)=200x-\frac{3}{2}x^2-\frac{1}{3}x^3$에 대하여 $f'(10)$의 값

39. 함수 $f(x)=7x^3-ax+3$에 대하여 $f'(1)=2$를 만족시키는 상수 a의 값

40. 이차함수 $f(x)=x^2+3x$에 대하여 $f(2)+f'(2)$의 값

◪ 다음 함수를 미분하여라.

41. $y=(x-1)(2x+5)$

42. $y=(x-3)(2x-1)$

43. $y=-5x(x^2+1)$

44. $y=(3x^2-2)(2x-1)$

45. $y=(2x^2-3)(x-2)$

46. $y=(x^2-4x+5)(3x+7)$

47. $y=(2x-1)(x^2-3x+1)$

48. $y=(2x^2+5)(x^2-2)$

49. $y=(x^2+3x-2)(x^2-4)$

50. $y=(x^2+x)(x^3+1)$

51. $y=(x^2-x)(x^3+1)$

52. $y=(2x^2+3)(x^3-x+3)$

53. $y=(3x^2+2)(x^3-3x+1)$

54. $y=(3x-4)^2$

55. $y=(x-1)^3$

56. $y=(3x-2)^4$

57. $y=(-3x+4)^5$

58. $y=(2x^2-x+5)^3$

59. $y=(x+2)^2(3x^2-1)$

60. $y=(x-5)^2(x^2+1)^3$

61. $y=x(x+3)(3x+1)$

62. $y=x(x+1)(x+2)$

63. $y=(x-5)(2x+1)(-x+7)$

64. $y=(x-1)(x+2)(2x+3)$

65. $y=x(x+2)(2x+1)$

66. $y=(2x-1)(x+3)(3x+2)$

67. $y=(x^2+1)(x+1)(x^2-2x)$

68. $y=(2x-5)^4$

69. $y=(x^2-2x+1)^5$

◪ **다음 함수 $f(x)$의 $x=1$에서의 미분계수를 구하여라.**

70. $f(x)=(2x-5)(x+1)$

71. $f(x)=(2x+1)(x^2+3x+1)$

72. $f(x)=(x^2+1)(x^2+x-2)$

73. $f(x)=(x^2+3)(x^3+9)$

74. $f(x)=(x^3+5)(x^2-1)$

75. $f(x)=(2x+1)^3$

76. $f(x)=(-3x+4)^6$

77. $f(x)=(2x^3+1)(x-1)^2$

정답 및 해설

1) $f'(x)=0$

$\Rightarrow f'(x)=\lim\limits_{\Delta x\to 0}\dfrac{f(x+\Delta x)-f(x)}{\Delta x}=\lim\limits_{\Delta x\to 0}\dfrac{4-4}{\Delta x}=0$

2) $f'(x)=0$

$\Rightarrow f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}=\lim\limits_{h\to 0}\dfrac{-5-(-5)}{h}=0$

3) $f'(x)=0$

$\Rightarrow f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}=\lim\limits_{h\to 0}\dfrac{10-10}{h}=0$

4) $f'(x)=1$

$\Rightarrow f'(x)=\lim\limits_{\Delta x\to 0}\dfrac{f(x+\Delta x)-f(x)}{\Delta x}$

$=\lim\limits_{\Delta x\to 0}\dfrac{\{(x+\Delta x)+3\}-(x+3)}{\Delta x}$

$=\lim\limits_{\Delta x\to 0}\dfrac{\Delta x}{\Delta x}=1$

5) $f'(x)=2$

$\Rightarrow f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}=\lim\limits_{h\to 0}\dfrac{2(x+h)-2x}{h}$

$=\lim\limits_{h\to 0}2=2$

6) $f'(x)=3$

$\Rightarrow f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$

$=\lim\limits_{h\to 0}\dfrac{\{3(x+h)+4\}-(3x+4)}{h}=\lim\limits_{h\to 0}\dfrac{3h}{h}$

$=\lim\limits_{h\to 0}3=3$

7) $f'(x)=2x$

$\Rightarrow f'(x)=\lim\limits_{\Delta x\to 0}\dfrac{f(x+\Delta x)-f(x)}{\Delta x}$

$=\lim\limits_{\Delta x\to 0}\dfrac{\{(x+\Delta x)^2-4\}-(x^2-4)}{\Delta x}$

$=\lim\limits_{\Delta x\to 0}\dfrac{2x\Delta x+(\Delta x)^2}{\Delta x}$

$=\lim\limits_{\Delta x\to 0}(2x+\Delta x)=2x$

8) $f'(x)=2x-3$

$\Rightarrow f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$

$=\lim\limits_{h\to 0}\dfrac{\{(x+h)^2-3(x+h)\}-(x^2-3x)}{h}$

$=\lim\limits_{h\to 0}\dfrac{2hx+h^2-3h}{h}$

$=\lim\limits_{h\to 0}(2x+h-3)=2x-3$

9) $f'(x)=2x-5$

$\Rightarrow f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$

$=\lim\limits_{h\to 0}\dfrac{(x+h)^2-5(x+h)-(x^2-5x)}{h}$

$=\lim\limits_{h\to 0}\dfrac{2xh+h^2-5h}{h}=\lim\limits_{h\to 0}(2x+h-5)$

$=2x-5$

10) $f'(x)=8x$

$\Rightarrow f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$

$=\lim\limits_{h\to 0}\dfrac{4(x+h)^2-4x^2}{h}$

$=\lim\limits_{h\to 0}\dfrac{8xh+4h^2}{h}=\lim\limits_{h\to 0}(8x+4h)=8x$

11) $f'(x)=4x^3$

$\Rightarrow f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$

$=\lim\limits_{h\to 0}\dfrac{(x+h)^4-x^4}{h}$

$=\lim\limits_{h\to 0}(4x^3+6hx^2+4h^2x+h^3)$

$=4x^3$

12) $f'(x)=2,\ f'(2)=2$

$\Rightarrow f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$

$=\lim\limits_{h\to 0}\dfrac{\{2(x+h)+5\}-(2x+5)}{h}$

$=\lim\limits_{h\to 0}\dfrac{2h}{h}=2$

따라서 $f(x)$의 $x=2$에서의 미분계수는 $f'(2)=2$

13) $f'(x)=3,\ f'(2)=3$

$\Rightarrow f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$

$=\lim\limits_{h\to 0}\dfrac{\{3(x+h)-7\}-(3x-7)}{h}$

$=\lim\limits_{h\to 0}\dfrac{3h}{h}=3$

따라서 $f(x)$의 $x=2$에서의 미분계수는 $f'(2)=3$

14) $f'(x)=2x,\ f'(2)=4$

$\Rightarrow f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$

$=\lim\limits_{h\to 0}\dfrac{(x+h)^2-x^2}{h}$

$=\lim\limits_{h\to 0}\dfrac{2xh+h^2}{h}$

$=\lim\limits_{h\to 0}(2x+h)=2x$

따라서 $f(x)$의 $x=2$에서의 미분계수는
$f'(2)=2\cdot 2=4$

15) $f'(x)=2x+2,\ f'(2)=6$
⇨ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$
$=\lim_{h\to 0}\frac{\{(x+h)^2+2(x+h)\}-(x^2+2x)}{h}$
$=\lim_{h\to 0}\frac{2hx+h^2+2h}{h}$
$=\lim_{h\to 0}(2x+h+2)=2x+2$
따라서 $f(x)$의 $x=2$에서의 미분계수는
$f'(2)=2\times 2+2=6$

16) $f'(x)=2x+1,\ f'(2)=5$
⇨ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$
$=\lim_{h\to 0}\frac{\{(x+h)^2+(x+h)\}-(x^2+x)}{h}$
$=\lim_{h\to 0}\frac{2xh+h^2+h}{h}=\lim_{h\to 0}(2x+h+1)$
$=2x+1$
따라서 $f(x)$의 $x=2$에서의 미분계수는
$f'(2)=2\cdot 2+1=5$

17) $f'(x)=2x-1,\ f'(2)=3$
⇨ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$
$=\lim_{h\to 0}\frac{\{(x+h)^2-(x+h)\}-(x^2-x)}{h}$
$=\lim_{h\to 0}\frac{2hx+h^2-h}{h}=\lim_{h\to 0}(2x+h-1)$
$=2x-1$
따라서 $f(x)$의 $x=2$에서의 미분계수는
$f'(2)=2\times 2-1=3$

18) $y'=-8x^7$
⇨ $y'=(-x^8)'=-8x^7$

19) $y'=3x^2$
⇨ $y'=3x^{3-1}=3x^2$

20) $y'=5x^4$
⇨ $y'=5x^{5-1}=5x^4$

21) $y'=9x^8$
⇨ $y'=9x^{9-1}=9x^8$

22) $y'=10x^9$
⇨ $y'=10x^{10-1}=10x^9$

23) $y'=0$
⇨ $y'=(6)'=0$

24) $y'=0$

25) $y'=0$

26) $y'=18x^5$
⇨ $y'=(3x^6)'=18x^5$

27) $y'=2$
⇨ $y'=(2x+3)'=(2x)'+(3)'=2$

28) $y'=3$
⇨ $y'=(3x+2)'=(3x)'+(2)'=3$

29) $y'=-5$
⇨ $y'=(-5x+2)'=(-5x)'+(2)'=-5$

30) $y'=-2x+2$
⇨ $y'=(-x^2+2x-4)'=(-x^2)'+(2x)'-(4)'$
$=-2x+2$

31) $y'=-2x+4$
⇨ $y'=(-x^2+4x+3)'=(-x^2)'+(4x)'+(3)'$
$=-2x+4$

32) $y'=-2x+8$
⇨ $y'=(-x^2+8x+5)'$
$=(-x^2)'+(8x)'+(5)'=-2x+8$

33) $y'=x-1$
⇨ $y'=\left(\frac{1}{2}x^2-x+3\right)'=\left(\frac{1}{2}x^2\right)'-(x)'+(3)'=x-1$

34) $y'=6x^2-8x+3$
⇨ $y'=(2x^3-4x^2+3x+1)'$
$=(2x^3)-(4x^2)+(3x)'+(1)'=6x^2-8x+3$

35) $y'=x^3+x^2-x-1$
⇨ $y'=\left(\frac{1}{4}x^4+\frac{1}{3}x^3-\frac{1}{2}x^2-x\right)'$
$=\left(\frac{1}{4}x^4\right)'+\left(\frac{1}{3}x^3\right)'-\left(\frac{1}{2}x^2\right)'-(x)'=x^3+x^2-x-1$

36) $y'=x^4+x^3+x^2+x+1$
⇨ $y'=\left(\frac{1}{5}x^5+\frac{1}{4}x^4+\frac{1}{3}x^3+\frac{1}{2}x^2+x\right)'$
$=\left(\frac{1}{5}x^5\right)'+\left(\frac{1}{4}x^4\right)'+\left(\frac{1}{3}x^3\right)'+\left(\frac{1}{2}x^2\right)'+(x)'$
$=x^4+x^3+x^2+x+1$

37) 21
⇨ $f(x)=x^2+x+3$이므로 $f'(x)=2x+1$
$\therefore f'(10)=20+1=21$

38) 70
⇨ $f(x)=200x-\frac{3}{2}x^2-\frac{1}{3}x^3$이므로

$f'(x)=200-3x-x^2$
$\therefore f'(10)=200-30-100=70$

39) 19
⇨ $f(x)=7x^3-ax+3$이므로 $f'(x)=21x^2-a$
이때, $f'(1)=2$이므로 $21-a=2$ $\therefore a=19$

40) 17
⇨ $f(x)=x^2+3x$이므로 $f(2)=4+6=10$
$f'(x)=2x+3$이므로 $f'(2)=4+3=7$
$\therefore f(2)+f'(2)=10+7=17$

41) $y'=4x+3$
⇨ $y'=(x-1)'(2x+5)+(x-1)(2x+5)'$
$=1\times(2x+5)+(x-1)\times 2=4x+3$

42) $y'=4x-7$
⇨ $y'=(x-3)'(2x-1)+(x-3)(2x-1)'$
$=(2x-1)+2(x-3)=4x-7$

43) $y'=-15x^2-5$
⇨ $y'=(-5x)'(x^2+1)-5x(x^2+1)'$
$=-5(x^2+1)-5x\cdot 2x$
$=-15x^2-5$

44) $y'=18x^2-6x-4$
⇨ 곱의 미분법을 이용하면
$y'=\{(3x^2-2)(2x-1)\}'$
$=(3x^2-2)'(2x-1)+(3x^2-1)(2x-1)'$
$=6x(2x-1)+(3x^2-2)\times 2$
$=(12x^2-6x)+(6x^2-4)$
$=18x^2-6x-4$

45) $y'=6x^2-8x-3$
⇨ 곱의 미분법을 이용하면
$y'=\{(2x^2-3)(x-2)\}'$
$=(2x^2-3)'(x-2)+(2x^2-3)(x-2)'$
$=4x(x-2)+(2x^2-3)\times 1$
$=(4x^2-8x)+(2x^2-3)$
$=6x^2-8x-3$

46) $y'=9x^2-10x-13$
⇨ $y'=(x^2-4x+5)'(3x+7)+(x^2-4x+5)(3x+7)'$
$=(2x-4)(3x+7)+3(x^2-4x+5)$
$=9x^2-10x-13$

47) $y'=6x^2-14x+5$
⇨ $y'=(2x-1)'(x^2-3x+1)+(2x-1)(x^2-3x+1)'$
$=2\times(x^2-3x+1)+(2x-1)(2x-3)$
$=6x^2-14x+5$

48) $y'=8x^3+2x$
⇨ $y'=(2x^2+5)'(x^2-2)+(2x^2+5)(x^2-2)'$
$=4x(x^2-2)+(2x^2+5)\times 2x=8x^3+2x$

49) $y'=4x^3+9x^2-12x-12$
⇨ $y'=(x^2+3x-2)'(x^2-4)+(x^2+3x-2)(x^2-4)'$
$=(2x+3)(x^2-4)+(x^2+3x-2)\times 2x$
$=4x^3+9x^2-12x-12$

50) $y'=5x^4+4x^3+2x+1$
⇨ $y'=(x^2+x)'(x^3+1)+(x^2+x)(x^3+1)'$
$=(2x+1)(x^3+1)+(x^2+x)\times 3x^2$
$=5x^4+4x^3+2x+1$

51) $y'=5x^4-4x^3+2x-1$
⇨ $y'=(x^2-x)'(x^3+1)+(x^2-x)(x^3+1)'$
$=(2x-1)(x^3+1)+(x^2-x)\times 3x^2$
$=5x^4-4x^3+2x-1$

52) $y'=10x^4+3x^2+12x-3$
⇨ $y'=(2x^2+3)'(x^3-x+3)+(2x^2+3)(x^3-x+3)'$
$=4x(x^3-x+3)+(2x^2+3)(3x^2-1)$
$=10x^4+3x^2+12x-3$

53) $y'=15x^4-21x^2+6x-6$
⇨
$y'=(3x^2+2)'(x^3-3x+1)+(3x^2+2)(x^3-3x+1)'$
$=6x(x^3-3x+1)+(3x^2+2)(3x^2-3)$
$=15x^4-21x^2+6x-6$

54) $y'=6(3x-4)$
⇨ $y'=2(3x-4)(3x-4)'=6(3x-4)$

55) $y'=3(x-1)^2$

56) $y'=12(3x-2)^3$
⇨ $y'=\{(3x-2)^4\}'=4(3x-2)^{4-1}(3x-2)'$
$=12(3x-2)^3$

57) $y'=-15(-3x+4)^4$
⇨ $y'=5(-3x+4)^4\times(-3)=-15(-3x+4)^4$

58) $y'=3(2x^2-x+5)^2(4x-1)$
⇨ $y'=\{(2x^2-x+5)^3\}'$
$=3(2x^2-x+5)^{3-1}(2x^2-x+5)'$
$=3(2x^2-x+5)^2(4x-1)$

59) $y'=2(x+2)(6x^2+6x-1)$
⇨ $y'=\{(x+2)^2\}'(3x^2-1)+(x+2)^2(3x^2-1)'$
$=2(x+2)(x+2)'(3x^2-1)+(x+2)^2\cdot 6x$
$=2(x+2)(3x^2-1)+6x(x+2)^2$
$=2(x+2)(6x^2+6x-1)$

60) $y'=2(x-5)(x^2+1)^2(4x^2-15x+1)$
⇨ $y'=\{(x-5)^2\}'(x^2+1)^3+(x-5)^2\{(x^2+1)^3\}'$
$=2(x-5)(x-5)'(x^2+1)^3$
$+(x-5)^2\cdot3(x^2+1)^2(x^2+1)'$
$=2(x-5)(x^2+1)^3+6x(x-5)^2(x^2+1)^2$
$=2(x-5)(x^2+1)^2(4x^2-15x+1)$

61) $y'=9x^2+20x+3$
⇨ $y'=x'(x+3)(3x+1)+x(x+3)'(3x+1)$
$+x(x+3)(3x+1)'$
$=1\times(x+3)(3x+1)+x\times1\times(3x+1)+x(x+3)\times3$
$=9x^2+20x+3$

62) $y'=3x^2+6x+2$
⇨ $y'=(x)'(x+1)(x+2)+x(x+1)'(x+2)$
$+x(x+1)(x+2)'$
$=(x+1)(x+2)+x(x+2)+x(x+1)$
$=3x^2+6x+2$

63) $y'=-6x^2+46x-58$
⇨ $y'=(x-5)'(2x+1)(-x+7)$
$+(x-5)(2x+1)'(-x+7)+(x-5)(2x+1)(-x+7)'$
$=(2x+1)(-x+7)+2(x-5)(-x+7)$
$-(x-5)(2x+1)$
$=-6x^2+46x-58$

64) $y'=6x^2+10x-1$
⇨ $y'=\{(x-1)(x+2)(2x+3)\}'$
$=(x-1)'(x+2)(2x+3)+(x-1)(x+2)'(2x+3)$
$+(x-1)(x+2)(2x+3)'$
$=1\times(x+2)(2x+3)+(x-1)\times1\times(2x+3)$
$+(x-1)(x+2)\times2$
$=6x^2+10x-1$

65) $y'=6x^2+10x+2$
⇨ $y'=x'(x+2)(2x+1)+x(x+2)'(2x+1)$
$+x(x+2)(2x+1)'$
$=1\cdot(x+2)(2x+1)+x\cdot1\cdot(2x+1)+x(x+2)\cdot2$
$=6x^2+10x+2$

66) $y'=18x^2+38x+1$
⇨ $y'=\{(2x-1)(x+3)(3x+2)\}'$
$=(2x-1)'(x+3)(3x+2)+(2x-1)(x+3)'(3x+2)$
$+(2x-1)(x+3)(3x+2)'$
$=2\times(x+3)(3x+2)+(2x-1)\times1\times(3x+2)$
$+(2x-1)(x+3)\times3$
$=18x^2+38x+1$

67) $y'=5x^4-4x^3-3x^2-2x-2$
⇨ $y'=(x^2+1)'(x+1)(x^2-2x)$
$+(x^2+1)(x+1)'(x^2-2x)$
$+(x^2+1)(x+1)(x^2-2x)'$
$=2x(x+1)(x^2-2x)+(x^2+1)\times1\times(x^2-2x)$
$+(x^2+1)(x+1)(2x-2)$
$=5x^4-4x^3-3x^2-2x-2$

68) $y'=8(2x-5)^3$
⇨ $y'=4(2x-5)^3\cdot2=8(2x-5)^3$

69) $y'=10(x-1)^9$
⇨ $y'=5(x^2-2x+1)^4\cdot(2x-2)=10(x-1)^9$

70) 1
⇨ $f'(x)=(2x-5)'(x+1)+(2x-5)(x+1)'$
$=2\cdot(x+1)+(2x-5)\cdot1$
$=4x-3$
$\therefore f'(1)=4\cdot1-3=1$

71) 25
⇨ $f'(x)=(2x+1)'(x^2+3x+1)$
$+(2x+1)(x^2+3x+1)'$
$=2(x^2+3x+1)+(2x+1)(2x+3)$
$=6x^2+14x+5$
$f'(1)=6+14+5=25$

72) 6
⇨ $f(x)=(x^2+1)(x^2+x-2)$이므로
$f'(x)=(x^2+1)'(x^2+x-2)+(x^2+1)(x^2+x-2)'$
$=2x(x^2+x-2)+(x^2+1)(2x+1)$
$\therefore f'(1)=2\cdot0+2\cdot3=6$

73) 32
⇨ $f'(x)=(x^2+3)'(x^3+9)+(x^2+3)(x^3+9)'$
$=2x(x^3+9)+(x^2+3)\times3x^2$
$=5x^4+9x^2+18x$
$\therefore f'(1)=5+9+18=32$

74) 12
⇨ $f(x)=(x^3+5)(x^2-1)$이므로
$f'(x)=(x^3+5)'(x^2-1)+(x^3+5)(x^2-1)'$
$=3x^2(x^2-1)+(x^3+5)\times2x$
$\therefore f'(1)=3\cdot0+6\cdot2=12$

75) 54
⇨ $f'(x)=3(2x+1)^2\cdot2=6(2x+1)^2$
$\therefore f'(1)=6(2+1)^2=54$

76) -18
⇨ $f'(x)=6(-3x+4)^5\times(-3)=-18(-3x+4)^5$
$\therefore f'(1)=-18(-3+4)^5=-18$

77) 0
⇨ $f(x)=(2x^3+1)(x-1)^2$이므로
$f'(x)=(2x^3+1)'(x-1)^2+(2x^3+1)\{(x-1)^2\}'$

$=6x^2(x-1)^2+(2x^3+1)\times 2(x-1)$

$\therefore f'(1)=6\cdot 0+3\cdot 0=0$