Part A—The use of a calculator is not allowed.

Find the derivative of each of the following functions.

1. $y = 6x^5 - x + 10$

2. $f(x) = \dfrac{1}{x} + \dfrac{1}{\sqrt[3]{x^2}}$

3. $y = \dfrac{5x^6 - 1}{x^2}$

4. $y = \dfrac{x^2}{5x^6 - 1}$

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

6. $y = \sqrt{\dfrac{2x+1}{2x-1}}$

7. $y = 10\cot(2x - 1)$

8. $y = 3x\,\sec(3x)$

9. $y = 10\cos[\sin(x^2 - 4)]$

10. $y = 8\cos^{-1}(2x)$

11. $y = 3e^5 + 4xe^x$

12. $y = \ln(x^2 + 3)$

Part B—Calculators are allowed.

13. Find $\dfrac{dy}{dx}$, if $x^2 + y^3 = 10 - 5xy$.

14. The graph of a function f on $[1, 5]$ is shown in Figure 6.9-1. Find the approximate value of $f'(4)$.

15. Let f be a continuous and differentiable function. Selected values of f are shown below. Find the approximate value of f' at $x = 2$.

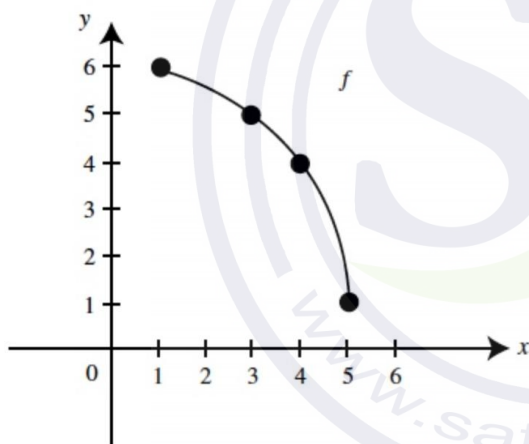| x	−1	0	1	2	3
f	6	5	6	9	14

Figure 6.9-1

16. If $f(x) = x^5 + 3x - 8$, find $(f^{-1})'(-8)$.

17. Write an equation of the tangent to the curve $y = \ln x$ at $x = e$.

18. If $y = 2x \sin x$, find $\dfrac{d^2 y}{dx^2}$ at $x = \dfrac{\pi}{2}$.

19. If the function $f(x) = (x-1)^{2/3} + 2$, find all points where f is not differentiable.

20. Write an equation of the normal line to the curve $x \cos y = 1$ at $\left(2, \dfrac{\pi}{3}\right)$.

21. $\displaystyle\lim_{x \to 3} \dfrac{x^2 - 3x}{x^2 - 9}$

22. $\displaystyle\lim_{x \to 0^+} \dfrac{\ln(x+1)}{\sqrt{x}}$

23. $\displaystyle\lim_{x \to 0} \dfrac{e^x - 1}{\tan 2x}$

24. $\displaystyle\lim_{x \to 0} \dfrac{\cos(x) - 1}{\cos(2x) - 1}$

25. $\displaystyle\lim_{x \to \infty} \dfrac{5x + 2\ln x}{x + 3\ln x}$