Derivatives

Compute $\frac{\mathrm{d}f}{\mathrm{d}x}$ of following functions:

1. $f(x) = 5x^2 - 7x - 2$
2. $f(x) = 5(x^2 + 1) \cdot 2x$
3. $f(x) = 2 - \sqrt{x}$
4. $f(x) = \frac{6}{x^3}$
5. $f(x) = 2x - 3\sqrt[3]{x^2}$
6. $f(x) = \sqrt{x} + \frac{1}{x^2}$
7. $f(x) = 3^x + 2e^x$
8. $f(x) = \tan x + \sin x$
9. $f(x) = \frac{(x^2+2)^2}{4}$
10. $f(x) = (x + 1)^3$

Derivative of composed function

Compute $\frac{\mathrm{d}f}{\mathrm{d}x}$ of following functions:

11. $f(x) = \tan(5x)$
12. $f(x) = \arctan(3x)$
13. $f(x) = e^{5x^2-2x+1}$
14. $f(x) = \ln(\ln x)$
15. $f(x) = e^{-\frac{1}{x^2}}$
16. $f(x) = \frac{1}{9-x^2}$
17. $f(x) = \sqrt{3x + \cos x}$
18. $f(x) = \cos^3(3x^2 + 2x)$
19. $f(x) = \ln(x + \sqrt{1 + x^2})$
20. $f(x) = \arctan(\sqrt{x})$

Derivative of multiplication

Compute $\frac{\mathrm{d}f}{\mathrm{d}x}$ of following functions:

21. $f(x) = x \ln x$
22. $f(x) = x^2 \cos x$
23. $f(x) = (x + 1)(x + 5)^8$
24. $f(x) = (x - 2)\sqrt[3]{x^2 - 4}$
25. $f(x) = (x^3 + 2)e^{4x}$
26. $f(x) = (x + 6)\sqrt{x + 1}$

Derivative of division

Compute $\frac{\mathrm{d}f}{\mathrm{d}x}$ of following functions:

27. $f(x) = \frac{x+1}{x-1}$
28. $f(x) = \frac{x^4+3}{3x}$
29. $f(x) = \frac{x+2}{\sqrt{5-x}}$
30. $f(x) = \frac{x^2+3}{x+5}$

Derivatives (repetition)

Compute $\frac{\mathrm{d}f}{\mathrm{d}x}$ of following functions:

1. $f(x) = \cos(x^2)$
2. $f(x) = \cos^2(x)$
3. $f(x) = \frac{1}{\tan(x)}$
4. $f(x) = \sqrt{x}\,\operatorname{cotan}(x)$
5. $f(x) = e^x \sin(5x)$
6. $f(x) = (x^2+1)^2 e^{2x}$

Higher derivatives

Compute $\frac{\mathrm{d}y}{\mathrm{d}x}$ and $\frac{\mathrm{d}^2y}{\mathrm{d}x^2}$ of following functions:

1. $y(x) = e^{-x^2}$
2. $y(x) = x^2 \ln x$
3. $y(x) = \frac{1+x}{1-x}$