3.5 / Practice workbook

Selecting Procedures for Calculating Derivatives

Practice

Problems 1–11 / Show your reasoning

1 For each function, name the first rule to use, then find the derivative. (a) $f(x) = \dfrac{x^2 + 3}{x}$ (b) $g(x) = e^x \sin(2x)$ (c) $h(x) = (\ln x)^3$

2 Let $h(x) = \ln\left(x^2 e^x\right)$ for $x > 0$. Use the properties of logarithms to rewrite $h(x)$, then find $h'(x)$.

3 The curve $x^2 + xy + y^2 = 7$ passes through $(1, 2)$. Find $\dfrac{dy}{dx}$ at $(1, 2)$.

4 Let $y = \sin^{-1}(2x)$. Find $\dfrac{dy}{dx}$ at $x = \dfrac{1}{4}$.

5 If $h(x) = \dfrac{e^x}{x^2 + 1}$, then $h'(1) =$

A. $-\dfrac{e}{2}$
B. 0
C. $\dfrac{e}{2}$
D. e

6 What is the value of $\dfrac{d}{dx}\left[x\sqrt{2x + 1}\right]$ at $x = 4$?

A. $\dfrac{1}{3}$
B. $\dfrac{4}{3}$
C. $\dfrac{11}{3}$
D. $\dfrac{13}{3}$

7 If $y = \ln(\sin x)$, then $\frac{dy}{dx}$ at $x = \frac{\pi}{4}$ is

A. -1
B. $\frac{\sqrt{2}}{2}$
C. 1
D. $\sqrt{2}$

8 Let $f(x) = x^3 + 2x + 1$, and let g be the inverse function of f. What is $g'(4)$?

A. $\frac{1}{5}$
B. $\frac{1}{50}$
C. 5
D. 50

3.5 / AP-style free response

Problem 9 ➤ */ Show the work and the reasons a grader looks for.*

Let $k(x) = \dfrac{x}{\sqrt{x^2 + 16}}$.

(a) Show that $k'(x) = \dfrac{16}{(x^2 + 16)^{\frac{3}{2}}}$.

(b) Write an equation of the line tangent to the graph of k at $x = 3$.

10 The functions r and w are differentiable; the table gives values. Let $H(x) = \dfrac{r(w(x))}{x}$. Find $H'(3)$.

x	1	3
$r(x)$	6	2
$r'(x)$	4	-1
$w(x)$	3	1
$w'(x)$	5	2

11 Let $f(x) = x^{\pi} + \pi^{x} + \pi^{2}$. Find $f'(1)$.

3.5 / Answer key

Selecting Procedures for Calculating Derivatives

1 (a) rewrite: $x + 3x^{-1}$, so $f'(x) = 1 - \frac{3}{x^2}$; (b) product rule (chain inside): $e^x \sin 2x + 2e^x \cos 2x$; (c) chain rule: $\frac{3(\ln x)^2}{x}$

2 $h(x) = 2\ln x + x$, $h'(x) = \frac{2}{x} + 1$

3 $-\frac{4}{5}$

4 $\frac{4}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$

5 (B)

6 (D)

7 (C)

8 (A)

9 (a) quotient rule with the chain rule for the bottom, then multiply by $\frac{\sqrt{x^2+16}}{\sqrt{x^2+16}}$; (b) $y = \frac{3}{5} + \frac{16}{125}(x - 3)$

10 2

11 $f'(1) = \pi + \pi \ln \pi$