Derivatives Practice

1. $\lim_{h\to 0}\dfrac{(2+h)^5-32}{h}$ is

(A) $f'(5)$, where $f(x)=x^2$

(B) $f'(2)$, where $f(x)=x^5$

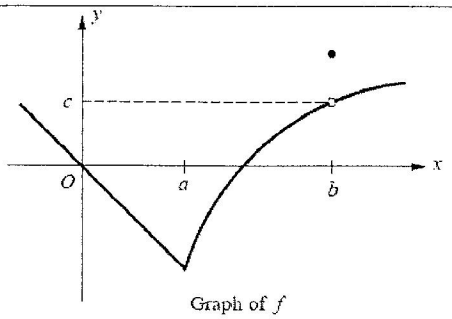
(C) $f'(5)$, where $f(x)=2^x$

(D) $f'(2)$, where $f(x)=2^x$

2. What is the instantaneous rate of change at $x=-1$ of the function $f(x)=-\sqrt[3]{x^2}$?

(A) $-\dfrac{2}{3}$ (B) $-\dfrac{1}{3}$ (C) $\dfrac{1}{3}$ (D) $\dfrac{2}{3}$

3.



Graph of f

The graph of a function f is shown in the figure above. Which of the following statements must be false?

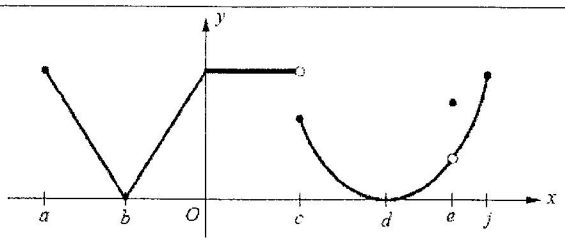
(A) $f(x)$ is defined for $0\le x\le b$.

(B) $f(b)$ exists.

(C) $f'(b)$ exists.

(D) $\lim_{x\to a^-} f'(x)$ exists.

4.



Graph of f

The graph of a function f is shown in the figure above. At how many points in the interval $a<x<j$ is f' not defined?

(A) 3 (B) 4 (C) 5 (D) 6

5. If $f(x)=(x^3-2x+5)(x^{-2}+x^{-1})$, then $f'(1)=$

(A) -10 (B) -6 (C) $-\dfrac{9}{2}$ (D) $\dfrac{7}{2}$

6. If $f(x)=\dfrac{\sqrt{x}-1}{\sqrt{x}+1}$ then $f'(x)=$

(A) $\dfrac{\sqrt{x}}{(\sqrt{x}+1)^2}$ (C) $\dfrac{1}{\sqrt{x}(\sqrt{x}+1)^2}$

(B) $\dfrac{x}{(\sqrt{x}+1)^2}$ (D) $\dfrac{\sqrt{x}-1}{\sqrt{x}(\sqrt{x}+1)^2}$

7. If $g(2)=3$ and $g'(2)=-1$, what is the value of $\dfrac{d}{dx}\left(\dfrac{g(x)}{x^2}\right)$ at $x=2$?

(A) -3 (B) -1 (C) 0 (D) 2

8. If $y=x^2\cdot f(x)$, then $y''=$

(A) $x^2f''(x)+xf'(x)+2f(x)$ (C) $x^2f''(x)+2xf'(x)+f(x)$

(B) $x^2f''(x)+xf'(x)+f(x)$ (D) $x^2f''(x)+4xf'(x)+2f(x)$

9. If $f(x)=(x^2-3x)^{3/2}$, then $f'(4)=$

(A) $\dfrac{15}{2}$ (B) 9 (C) $\dfrac{21}{2}$ (D) 15

10. If $f(x)=\sin(\cos 2x)$, then $f'(\dfrac{\pi}{4})=$

(A) 0 (B) -1 (C) 1 (D) -2

11. $\dfrac{d}{dx}\left[x^2\cos 2x\right]=$

(A) $-2x\sin 2x$ (C) $2x(x\sin 2x-\cos 2x)$

(B) $2x(-x\sin 2x+\cos 2x)$ (D) $2x(x\sin 2x-\cos 2x)$

12. If $f(x)=e^{\tan x}$, then $f'(\dfrac{\pi}{4})=$

(A) $\dfrac{e}{2}$ (B) e (C) $2e$ (D) $\dfrac{e^2}{2}$

13. If $y=\ln(\cos x)$, then $y'=$

(A) $-\tan x$ (B) $\tan x$ (C) $-\cot x$ (D) $\csc x$

14. The equation of the line tangent to the graph of $y = x\sqrt{3+x^2}$ at the point $(1, 2)$ is

(A) $y = \frac{3}{2}x - \frac{1}{2}$ (B) $y = 2x + \frac{1}{2}$ (C) $y = \frac{5}{2}x - \frac{1}{2}$ (D) $y = \frac{5}{2}x + \frac{1}{2}$

15. If $3xy + x^2 - 2y^2 = 2$, then the value of $\frac{dy}{dx}$ at the point $(1,1)$ is

(A) 5 (B) $\frac{7}{2}$ (C) $-\frac{1}{2}$ (D) $-\frac{7}{2}$

16. An equation of the line tangent to the graph of $3y^2 - x^3 - xy^2 = 7$ at the point $(1, 2)$ is

(A) $y = \frac{3}{4}x - \frac{3}{8}$ (B) $y = \frac{3}{4}x + \frac{1}{2}$ (C) $y = -\frac{7}{8}x + \frac{3}{2}$ (D) $y = \frac{7}{8}x + \frac{9}{8}$

17. If $x + \sin y = y + 3$, then $\frac{d^2y}{dx^2} =$

(A) $\frac{-\sin y}{(1-\cos y)^2}$ (B) $\frac{-\sin y}{(1+\cos y)^2}$ (C) $\frac{-\sin y}{(1-\cos y)^3}$ (D) $\frac{-\sin y}{(1+\cos y)^3}$

18. Let f and g be functions that are differentiable everywhere. If g is the inverse function of f and if $g(3) = 4$ and $f'(4) = \frac{3}{2}$, then $g'(3) =$

(A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{4}{3}$

19. If $f(x) = x^3 - x + 2$, then $(f^{-1})'(2) =$

(A) $\frac{1}{2}$ (B) $\frac{2}{3}$ (C) 4 (D) 6

20. $\frac{d}{dx}(\arcsin x^2) =$

(A) $-\frac{2x}{\sqrt{1-x^2}}$ (B) $\frac{2x}{\sqrt{x^2-1}}$ (C) $\frac{2x}{\sqrt{x^4-1}}$ (D) $\frac{2x}{\sqrt{1-x^4}}$

21. Some values of differentiable function f are shown in the table below.
What is the approximation value of $f'(3.5)$?

x	3.0	3.3	3.8	4.2	4.9
$f(x)$	21.8	26.1	32.5	38.2	48.7

(A) 8 (B) 10 (C) 13 (D) 16