

Unit 4 Additional Review – Derivative Rules

1. Find the equation of the tangent line to the curve $f(x) = \cos 2x$ at $x = \frac{2\pi}{3}$

b. Find the equation of the normal line to $f(x) = \cos 2x$ at $x = \frac{2\pi}{3}$

2. Find $f'(-1)$ if $f(x) = \frac{5x^2 + 3}{x}$

Find the derivative.

3. $f(x) = 3x^4 + e^{2x} + \tan(x^3)$

4. $y = e^{\frac{x^2+1}{5x-2}}$

5. $y = \frac{e^{x^3}}{\sin x}$

6. $y = \sin^4(6x+1)$

7. $f(x) = \cos \sqrt[3]{3x-4}$

8. $y = \ln(6x^2 - 4x) + 7 \csc(x^2) - \frac{10}{x}$

9. $f(x) = \sin^{-1}(5e^x)$

Use logarithmic differentiation to find the derivative.

10. $y = (2x-3)^{x^2}$

11. $y = x^4(2x-5)^3$

In #12 and 13, use implicit differentiation to find the derivative.

12. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ when $y^{-2} = 2x^3$

13. $3xy^2 - \sin y = 4x + 3$

Entire page 3 points each

In #14-16, use the chart information to find the following.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
-4	-2	-3	5	3
-2	0	3	7	1
0	2	4	4	-2
1	-2	-3	-1	3
2	4	1	3	-3
4	5	-4	2	-4

14. Find $\frac{d}{dx} \left[\frac{g(x)}{f(x)} \right]$ when $x = -4$.

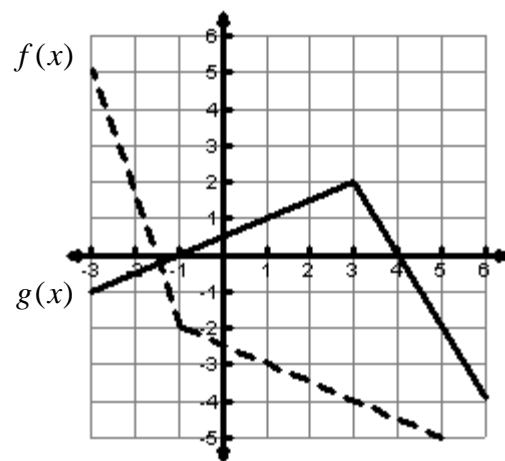
15. Find $\frac{d}{dx} [x - f(\sqrt{x})]$ when $x = 4$.

16. Find $\frac{d}{dx} [g^{-1}(x)]$ when $x = 1$.

In 17- 19, f and g are functions whose graphs are given to the right. Find the following.

17. $p(x) = 3f(x) \cdot g(x)$, find $p'(2)$.

18. $m(x) = \frac{g(x)}{x}$, find $m'(-2)$.



19. $h(x) = f(g(x))$, find $h'(4)$.

Multiple Choice: Show all work leading to your answer.

_____ 20. $\lim_{h \rightarrow 0} \frac{\sin\left(\frac{\pi}{2} + h\right) - 1}{h} =$

- (a) 1 (b) -1 (c) 0 (d) ∞ (e) none of these

_____ 21. If $f(x) = x \ln x$, which of the following is $f'''(e)$?

- (a) $\frac{1}{e}$ (b) 0 (c) $-\frac{1}{e^2}$ (d) $\frac{1}{e^2}$ (e) $\frac{2}{e^3}$

_____ 22. If $f(x) = 16\sqrt{x}$, then $\left. \frac{d^2 y}{dx^2} \right|_{x=4}$ is

- (a) -32 (b) -16 (c) -4 (d) -2 (e) $-\frac{1}{2}$

_____ 23. If $f(x) = x^4 - 4x^3 + 4x^2 - 1$, then the values of x for which $f(x)$ has a horizontal tangent line are:

- (a) 1, 2 (b) 0, -1, -2 (c) -1, 2 (d) 0 (e) 0, 1, 2

_____ 24. If $\sin x - \cos y - 2 = 0$, then $\frac{dy}{dx} =$

- (a) $-\cot x$ (b) $-\cot y$ (c) $\frac{\cos x}{\sin y}$ (d) $-\csc y \cos x$ (e) $\frac{2 - \cos x}{\sin y}$

_____ 25. If $f(x) = \frac{1}{2 \sin 2x}$, then $f'(x) =$

- (a) $-\csc(2x)\cot(2x)$ (b) $\frac{1}{4 \cos 2x}$ (c) $-4 \csc(2x) \cot(2x)$ (d) $\frac{\cos 2x}{2\sqrt{\sin 2x}}$ (e) $-\csc^2(2x)$

_____ 26. $\frac{d}{dx} \left(\frac{2}{(5x+1)^3} \right) =$

- a. $\frac{-30}{(5x+1)^2}$ b. $\frac{-30}{(5x+1)^4}$ c. $\frac{-6}{(5x+1)^4}$ d. $\frac{-10}{3(5x+1)^{4/3}}$ e. $\frac{30}{(5x+1)^4}$

Calculator Allowed

27. The equation of motion of a particle is: $s(t) = t^3 - 12t^2 + 36t + 4$, where s is in meters and t is in seconds.

Find the following when $0 < t < 7$. Be sure to include units where appropriate.

- A. Find the velocity function in terms of t .

- B. When is the particle at rest?

- C. When is the particle moving forward?

- D. What is the acceleration function in terms of t ?

- F. What is the velocity when the acceleration is zero?

- G. When is the particle slowing down?

- H. What is the displacement from $t = 0$ to $t = 7$?

- I. What is the total distance traveled from $t = 0$ to $t = 7$?

23. If $f(x) = \ln(x+1) - \sin^2 x$, find the following:

(a) $f(3)$

(b) $f'(3)$

(c) Find the smallest positive value of x at which the tangent line to $f(x)$ is horizontal.

(d) Find the smallest positive value of x at which the tangent line to the graph of f has a slope of $\frac{1}{2}$.

(e) $f''(0.22)$