

CALCULUS REVIEW 1 – DERIVATIVES

1. Use the definition of the derivative to evaluate the limits below:

$$\text{Ex A: } \lim_{h \rightarrow 0} \frac{(1+h)^{10} - 1}{h} =$$

$$\text{Ex B: } \lim_{h \rightarrow 0} \frac{\sqrt[4]{16+h} - 2}{h} =$$

$$\text{Ex C: } \lim_{x \rightarrow \pi} \frac{\cos(x) + 1}{x - \pi} =$$

$$\text{Ex D: } \lim_{t \rightarrow 1} \frac{t^4 + t - 2}{t - 1} =$$

2. If $f(x) = x^3 - 2x^2 + 7$, then $f'(-1) =$

3. If $f(x) = 2x - 11$, then $f'(7) =$

4. If u , v , and w are non-zero differentiable variable functions with derivatives u' , v' , w' ,

then the derivative of $\frac{wv}{u^2}$ is

5. If $g(x) = \frac{x-3}{x+3}$, then $g'(5) =$

6. If $y = \frac{4}{3-x^2}$, then $\frac{dy}{dx} =$

7. $\frac{d}{dx} \left(\frac{1}{x^3} - \frac{1}{x} + x^2 \right)$ at $x = -2$ is

8. If $y = \frac{1}{\sqrt{x}}$, find y'

9. If $f(x) = 2 \tan^2 x$, find $f'(x)$

10. If $y = \sin \sqrt{2x}$, find $y'(x)$

11. If $f(x) = \frac{\tan x}{x}$, find $f'\left(\frac{\pi}{4}\right)$

12. If $f(x) = \cos x - \sin x$, then $f'\left(\frac{\pi}{3}\right) =$

13. If $f(x) = \sqrt{3x}$, then $f'(3) =$

14. The fourth derivative of $f(x) = (3x - 7)^4$ is

15. If $y = 3\sin\left(\frac{x}{2}\right)$, then $\frac{d^2y}{dx^2} =$

16. If $y = 2 \sin x \cos x$, then $\frac{d^2y}{dx^2} =$

17. If $y^2 + 3xy = 19$, then $\frac{dy}{dx} =$

18. If $\tan(y - x) = x$ then $\frac{dy}{dx} =$

19. If $x^2y + xy^2 = 6$, then, at the point $(1, 2)$, y' is

20. Find the equation of the line that is **tangent** to $x + \sqrt{xy} = 6$ at $(4, 1)$

21. Let $f(x) = 5x^3 - 3x - 1$. Find an equation of the tangent to $f(x)$ at $x = -1$.

22. Find the point(s) on the curve $y = 2x^3 - 3x^2 - 12x + 20$ where the tangent

(A) is perpendicular to $y = 1 - \frac{x}{24}$

(B) is parallel to $y = \sqrt{2} - 12x$

23. Find the point on the graph of $y = 4\sqrt{x}$ at which the tangent line has the same slope as the line through $(5, 1)$ and $(9, 3)$.

24. Good Luck – you'll do great!

25. If $h(x) = f[g(x)]$, find $h'(3)$. if $f'(3)=5$, $f'(7)=6$, $g'(3)=8$, $g(3)=7$

26. If $r(t) = \frac{f(t)}{g(t)}$ find $r'(2)$.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
2	3	4	5	6

Answer Key Review 1:

1. A) 10 B) $\frac{1}{32}$

C) 0

D) 5

2. 7

3. 2

4. $\frac{u^2(wv' + vw') - 2wvuu'}{u^4}$

5. $\frac{3}{32}$

6. $\frac{8x}{(3-x^2)^2}$

7. $\frac{-63}{16}$

8. $\frac{-1}{2x^{\frac{3}{2}}}$

9. $4\tan x \sec^2 x$

10. $\frac{\cos \sqrt{2x}}{\sqrt{2x}}$

11. $\frac{8\pi - 16}{\pi^2}$

12. $\frac{-\sqrt{3}-1}{2}$

13. $\frac{1}{2}$

14. 1944

15. $\frac{-3}{4} \sin\left(\frac{x}{2}\right)$

16. $-8 \sin x \cos x$

17. $\frac{-3y}{2y+3x}$

18. $\cos^2(y-x) + 1$

19. $-\frac{8}{5}$

20. $y = -\frac{5}{4}x + 6$

21. $y = 12x + 9$

22. A) (3, 11) and (-2, 16)

B) (0, 20) and (1, 7)

23. (16, 16)

24. yep

25. 48

26. $\frac{2}{25}$

Derivatives: Review 2

- Find the derivative of the following: $\sin x - \cos y - 2 = 0$
- If a point moves on the curve $x^2 + y^2 = 25$, then at (0,5), $\frac{d^2y}{dx^2}$ is _____
- Find the derivative of the following: $x^3 - xy + y^3 = 1$
- Find the derivative of the following: $y = \sqrt{x^2 + 2x - 1}$
- Find the derivative of the following: $y = \frac{x}{\sqrt{1-x^2}}$
- $\lim_{h \rightarrow 0} \frac{\sin\left(\frac{\pi}{2} + h\right) - \sin\left(\frac{\pi}{2}\right)}{h} =$
- $\lim_{h \rightarrow 0} \frac{3(x+h)^{37} - 3(x)^{37}}{h} =$
- If $f(x) = 16\sqrt{x}$, then $f'''(4)$ is _____
- Find the derivative of the following: $y = \frac{1}{2 \sin 2x}$
- Find the derivative of the following: $y = \sec^2 \sqrt{x}$
- If $\lim_{x \rightarrow 0} \frac{g(x) - g(0)}{x} = 1$, then which of the following are true (pick 1)
 - g is not defined at $x = 0$
 - g is not continuous at $x = 0$
 - The limit of g as x approaches 0 equals 1
 - $g'(0) = 1$
 - $g'(1) = 0$
- Find the derivative of the following: $xy + y = 3$
- Find the derivative of the following: $x + \cos(x + y) = 0$
- If $f(x) = x^4 - 4x^2$, then $f^{iv}(2)$ is _____

15. Find the derivative of the following:

$$y = \frac{2-x}{3x+1}$$

Use the following table for Questions 16-22

x	f	f'	g	g'
0	2	1	5	-4
1	3	2	3	-3
2	5	3	1	-2
3	10	4	0	-1

16. If $A = f + 2g$, then $A'(3)$ is _____

17. If $B = f \cdot g$, then $B'(2)$ is _____

18. If $D = \frac{1}{g}$, then $D'(1)$ is _____

19. If $H(x) = \sqrt{f(x)}$, then $H'(3)$ is _____

20. If $K(x) = \left(\frac{f}{g}\right)$, then $K'(0)$ is _____

21. If $M = f(g(x))$, then $M'(1)$ is _____

22. If $P(x) = f(x^3)$, then $P'(1)$ is _____

Find the derivatives of the following:

23. $f(x) = \ln(e^{x^3})$

24. $g(x) = \ln(x^2 - 2x)$

25. $h(x) = 6^{3x}$

26. $j(x) = e^{2x^3}$

Use logarithmic differentiation to find the derivative:

27. $y = (\sin x)^x$

28. $y = \frac{2x\sqrt{x^3 - 7x}}{(x+2)(3x-9)^2}$

Answer Key Review 2

1. $-\csc y \cos x$

2. $-\frac{1}{5}$

3. $\frac{y - 3x^2}{3y^2 - x}$

4. $\frac{x+1}{\sqrt{x^2 + 2x - 1}}$

5. $\frac{1}{(1-x^2)^{\frac{3}{2}}}$

6. 0

7. The derivative of $3x^{37}$

8. $\frac{3}{16}$

9. $-\csc 2x \cot 2x$

10. $\frac{\sec^2 \sqrt{x} \tan \sqrt{x}}{\sqrt{x}}$

11. d.

12. $\frac{-y}{1+x}$

13. $\csc(x+y) - 1$

14. 24

15. $-\frac{7}{(3x+1)^2}$

16. 2

17. -7

18. $\frac{1}{3}$

19. $\frac{2}{\sqrt{10}}$

20. $\frac{13}{25}$

21. -12

22. 6

23. $3x^2$

24. $\frac{2(x-1)}{x(x-2)}$

25. $3 \ln 6 \cdot 6^{3x}$

26. $6x^2 e^{2x^3}$

27. $y' = (x \cot x + \ln \sin x)(\sin x)^x$

28. $y' = \left[\frac{1}{x} + \frac{3x^2 - 7}{2(x^3 - 7x)} - \frac{1}{x+2} - \frac{2}{x-3} \right] \left[\frac{2x\sqrt{x^3 - 7x}}{(x+2)(3x-9)^2} \right]$