Derivatives of exponential and sinusoidal functions worksheet – Grade 12

Grade 12 · Mixed level · 20 questions · **Version X9319**

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1. Differentiate $y = 3e^{5x}$.
   A. $15e^{5x}$ **B.** $15e^{4x}$ **C.** $15xe^{5x}$ **D.** $3e^{5x}$

2. Differentiate $y = 3e^{-2x}$.
   A. $3e^{-2x}$ **B.** $-6e^{-2x}$ **C.** $-6xe^{-3x}$ **D.** $-6e^{-3x}$

3. Differentiate $y = 6\cos(7x)$.
   A. $42\sin(7x)$ **B.** $42\cos(7x)$ **C.** $-42\sin(7x)$ **D.** $-42\cos(7x)$

4. Differentiate $y = 4\sin(4x)$.
   A. $-16\sin(4x)$ **B.** $-16\cos(4x)$ **C.** $16\cos(4x)$ **D.** $4\cos(4x)$

5. Differentiate $y = 7(5^x)$.
   A. $7x \cdot 5^{x-1}$ **B.** 35^x **C.** $7(\ln 5) \cdot 5^x$ **D.** $7 \cdot 5^x$

6. Differentiate $y = 2\sin(9x)$.
   A. $18\cos(9x)$ **B.** $-18\cos(9x)$ **C.** $-18\sin(9x)$ **D.** $18\sin(9x)$

7. Differentiate $y = \sin(7x)$.
   A. $\cos(7x)$ **B.** $-7\sin(7x)$ **C.** $7\sin(7x)$ **D.** $7\cos(7x)$

8. Differentiate $y = 9\dfrac{e^{4x}}{x}$.
   A. $36e^{4x}$ **B.** $9\dfrac{e^{4x}(1-4x)}{x^2}$ **C.** $9\dfrac{4e^{4x}}{x^2}$ **D.** $9\dfrac{e^{4x}(4x-1)}{x^2}$

9. Differentiate $y = 7e^{6x}\sin x$.
   A. $7e^{6x}(6\sin x - \cos x)$ **B.** $7e^{6x}(\sin x + 6\cos x)$ **C.** $42e^{6x}\cos x$
   D. $7e^{6x}(6\sin x + \cos x)$

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10. Differentiate $y = 9\cos(x^2 - 3)$.

    A. $18x\sin(x^2 - 3)$ **B.** $-18x\sin(x^2 - 3)$ **C.** $-9\sin(2x)$ **D.** $-9\sin(x^2 - 3)$

11. Differentiate $y = 6\dfrac{e^{-2x}}{x}$.

    A. $-12e^{-2x}$ **B.** $6\dfrac{e^{-2x}(-2x - 1)}{x^2}$ **C.** $6\dfrac{e^{-2x}(1 + 2x)}{x^2}$ **D.** $6\dfrac{-2e^{-2x}}{x^2}$

12. Differentiate $y = 6xe^{-7x}$.

    A. $6e^{-7x}(1 - 7x)$ **B.** $6e^{-7x}(x - 7)$ **C.** $-42e^{-7x}$ **D.** $-42xe^{-7x}$

13. Differentiate $y = 5\sin^2(5x)$.

    A. $5\cos^2(5x)$ **B.** $50\sin(5x)\cos(5x)$ **C.** $10\cos(5x)$ **D.** $50\cos(5x)$

14. Differentiate $y = 4\cos(x^2 + 3)$.

    A. $-4\sin(x^2 + 3)$ **B.** $8x\sin(x^2 + 3)$ **C.** $-8x\sin(x^2 + 3)$ **D.** $-4\sin(2x)$

15. Work out the x-coordinate of the point where $y = e^x - 28x$ has a horizontal tangent, to two decimal places.

    Answer: _____

16. At what value of x does $y = 4xe^{2x}$ have a horizontal tangent? (Give a fraction if needed.)

    Answer: _____

17. Work out the slope of the tangent to $y = 5e^{-3x}\sin x$ at x = 0.5 (radians), to two decimal places.

    Answer: _____

18. What is the slope of the tangent to $y = 7e^{-x}\sin x$ at x = 1 (radians), to two decimal places?

    Answer: _____

19. Find the x-coordinate of the point where $y = e^x - 20x$ has a horizontal tangent, to two decimal places.

    Answer: _____

20. What is the x-coordinate of the point where $y = e^x - 7x$ has a horizontal tangent, to two decimal places?

    Answer: _____

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Answer key · Version X9319

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1. **A (**$15e^{5x}$**)**
2. **B (**$-6e^{-2x}$**)**
3. **C (**$-42\sin(7x)$**)**
4. **C (**$16\cos(4x)$**)**
5. **C (**$7(\ln 5)\cdot 5^{x}$**)**
6. **A (**$18\cos(9x)$**)**
7. **D (**$7\cos(7x)$**)**
8. **D (**$9\dfrac{e^{4x}(4x-1)}{x^{2}}$**)**
9. **D (**$7e^{6x}(6\sin x+\cos x)$**)**
10. **B (**$-18x\sin(x^{2}-3)$**)**
11. **B (**$6\dfrac{e^{-2x}(-2x-1)}{x^{2}}$**)**
12. **A (**$6e^{-7x}(1-7x)$**)**
13. **B (**$50\sin(5x)\cos(5x)$**)**
14. **C (**$-8x\sin(x^{2}+3)$**)**
15. **3.33**
16. **-1/2**
17. **-0.63**
18. **-0.78**
19. **3.00**
20. **1.95**

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