Derivative Exam

Determine the first derivative of each of the following:

1. $f(x) = -5$

$$f'(x) = 0$$

2. $f(x) = x^6$

$$f'(x) = 0$$

3. $f(x) = -3x^{-5}$

$$f''(x) = -3 \cdot -5x^{-6} = \frac{15}{x^6}$$

4. $f(x) = 7x^{4/7}$

$$f'(x) = 7 \cdot \frac{4}{7} x^{\frac{-3}{7}} = \frac{4}{x^{\frac{3}{7}}}$$

5. $f(x) = 5^x$

$$f'(x) = 5^x \ln 5$$

6. $f(x) = 7^{6x}$

$$f'(x) = 7^{6x} \ln 7 \cdot 6$$

7. $f(x) = 9^{x^3}$

$$f'(x) = 9^{x^3} \ln 5 \cdot 3x^2$$

8. $f(x) = (3x + 5)^4$

$$f'(x) = 4(3x + 5)^3 \cdot 3$$
$$f'(x) = 12(3x + 5)^3$$

9. $f(x) = (x^2 - 3x^6)^5$

$$f'(x) = 5(x^2 - 3x^6)^4 \cdot (2x - 18x^5)$$
$$f'(x) = 5 \cdot (x^2)^4 (1 - 3x^4)^4 \cdot 2x(1 - 9x^4)$$
$$f'(x) = 10x^{10}(1 - 3x^4)^4 (1 - 9x^4)$$

10. $f(x) = e^7$

$$f'(x) = 0$$

11. $f(x) = e^{-3x}$

$$f'(x) = e^{-3x} \cdot -3$$

12. $f(x) = e^{(5x^2 - 1)}$

$$f'(x) = e^{(5x^2 - 1)} \cdot 10x$$

13. $f(x) = \ln 7x$

$$f'(x) = \frac{1}{7x} \cdot 7 = \frac{1}{x}$$

14. $f(x) = \ln x^5$

$$f'(x) = \frac{1}{x^5} \cdot 5x^4 = \frac{5}{x}$$

15. $f(x) = \ln^4 x$

$$f'(x) = 4(\ln x)^3 \cdot \frac{1}{x}$$

16. $f(x) = \log_5 x$

$$f'(x) = \frac{1}{x \ln 5}$$

17. $f(x) = \log_3(3x^2)$

$$f'(x) = \frac{1}{3x^2 \ln 3} \cdot 6x$$
$$f'(x) = \frac{2}{x \ln 3}$$

18. $f(x) = \log_4(3x^2 - 1)^3$

$$f'(x) = \frac{1}{(3x^2 - 1)^3 \ln 4} \cdot 3(3x^2 - 1)^2 \cdot 6x$$
$$f'(x) = \frac{18x}{(3x^2 - 1) \ln 4}$$

19. $f(x) = \sin 2x$

$$f'(x) = \cos 2x \cdot 2$$

20. $f(x) = \sin 5x^2$

$$f'(x) = \cos 5x^2 \cdot 10x$$

21. $f(x) = \sin^4 2x$

$$f'(x) = 4(\sin 2x)^3 \cdot \cos 2x \cdot 2$$

22. $f(x) = \cos 9x$

$f'(x) = -\sin 9x \cdot 9$

23. $f(x) = (\cos x^3)^5$

$f'(x) = 5(\cos x^3)^4 \cdot -\sin x^3 \cdot 3x^2$

$f'(x) = -15x^2 (\cos x^3)^4 \cdot \sin x^3$

24. $f(x) = \cos^3 2x^2$

$f'(x) = 3(\cos 2x^2)^2 \cdot -\sin 2x^2 \cdot 4x$

$f'(x) = -12x(\cos 2x^2)^2 \sin 2x^2$

25. $f(x) = \ln x^3 + x^2$

$f'(x) = \dfrac{1}{x^3} \cdot 3x^2 + 2x$

$f'(x) = \dfrac{1}{x} + 2x$

26. $f(x) = 4x^2 - 3x^{-4} + x^{5/3}$

$f'(x) = 8x - 3 \cdot -4x^{-5} + \dfrac{5}{3}x^{\frac{2}{3}}$

$f'(x) = 8x + \dfrac{12}{x^5} + \dfrac{5}{3}x^{\frac{2}{3}}$

27. $f(x) = \sin(\ln x^2)$

$f'(x) = \cos(\ln x^2) \cdot \dfrac{1}{x^2} \cdot 2x$

$f'(x) = \cos(\ln x^2) \cdot \dfrac{2}{x}$

28. $f(x) = 5^{\sin(x^3+5)}$

$f'(x) = 5^{\sin(x^3+5)} \cdot \ln 5 \cdot \cos(x^3 + 5) \cdot 3x^2$

29. $f(x) = \cos \sin \cos 5x$

$f'(x) = -\sin \sin \cos 5x \cdot \cos \cos 5x \cdot -\sin 5x \cdot 5$

30. $f(x) = \log_3 \cos(\ln 5x)$

$f'(x) = \dfrac{1}{\cos(\ln 5x) \ln 3} \cdot -\sin(\ln 5x) \cdot \dfrac{1}{5x} \cdot 5$

$f'(x) = -\dfrac{1}{\cos(\ln 5x) \ln 3} \cdot \sin(\ln 5x) \cdot \dfrac{1}{x}$