

CALCULUS 2
2026-2027
Mr. Kelly

The Summer Packet for CALCULUS 2!

Hello 2026-2027 Calculus 2 Students! Here's your Summer Packet (HW #1) and some general information.

Topics Covered:

- finding derivatives using the power rule
- finding derivatives using the product and quotient rules
- finding derivatives using the chain rule
- finding derivatives of trig, exponential and natural log functions
- finding derivatives using implicit differentiation
- finding equations of tangent lines at a point
- integrating indefinite integrals
- using u-Sub to integrate indefinite integrals
- evaluating definite integrals
- evaluating all kinds of limits

Answers:

The odd answers are provided on the last page, but you still must do **all** of the problems and show your work when necessary.

Due Date:

This assignment is due the first day of school, and it will count as your first homework grade (HW #1).

Assessment:

There will be a test on this material in the first week or two of the school year.

Purpose:

Understanding of the topics covered in this packet are essential for your success in Calculus 2.

Let me know if you have any questions. I'm looking forward to a great year in Calc 2!

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SUMMER PACKET!

Use the Power Rule to find the derivative of each function.

1) $f(x) = -3x^2 + 3$

2) $y = 4x^2 + 4x + 1$

3) $f(x) = -x - 3$

4) $y = 2 + x^{-4}$

5) $f(x) = 3$

6) $y = 5\sqrt[3]{x} + 2$

7) $f(x) = \sqrt[4]{x} + 4x^{-2}$

8) $f(x) = 5x^4 - 4\sqrt[5]{x^2} - 2x^{-5}$

Use the Product Rule to differentiate each function

9) $y = (4x^5 + 3)(-4x^4 + 4)$

10) $f(x) = (3x^2 + 4)(2x^2 - 2)$

Use the Quotient Rule to differentiate each function.

11) $y = \frac{5x^5}{x^4 + 2}$

12) $f(x) = \frac{1}{3x^3 + 3}$

Use the Chain Rule to differentiate each function.

13) $f(x) = (2x^3 + 5)^{-4}$

14) $f(x) = (4x + 5)^5$

$$15) f(x) = \sqrt{5x^5 + 2}$$

$$16) y = \sqrt[4]{3x+2}$$

Differentiate each Trig function. Always use the Chain Rule when necessary

$$17) f(x) = \sin 4x^5$$

$$18) y = \cos 4x^4$$

$$19) y = \tan 2x^3$$

$$20) y = \cos (\sin 2x^4)$$

Differentiate each Exponential or Log function. Always use the Chain Rule when necessary.

$$21) f(x) = e^{x^3}$$

$$22) f(x) = \ln 5x^5$$

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

$$24) f(x) = \ln(1 + e^{5x^3})$$

Use Implicit Differentiation to find $\frac{dy}{dx}$ in terms of x and y .

$$25) 2x^3 = 3y^3 + 5y^2$$

Use Implicit Differentiation to find $\frac{dy}{dx}$ at the given point.

$$26) 2y^2 + 2y = x^2 \text{ at } (-2, 1)$$

For each problem, find the equation of the tangent line to the function at the given point.

27) $y = x^2 + x + 2$; $(-1, 2)$

28) $f(x) = -\frac{1}{x+2}$; $(-1, -1)$

Integrate each indefinite integral.

29) $\int (18x^5 + 12x^2) dx$

30) $\int -15x^{-4} dx$

31) $\int \frac{21\sqrt[5]{x^2}}{5} dx$

32) $\int \frac{4}{x^5} dx$

$$33) \int -2\sin x \, dx$$

$$34) \int 2\cos x \, dx$$

$$35) \int -5x^{-1} \, dx$$

$$36) \int -2e^x \, dx$$

Use u-Sub to integrate the functions.

$$37) \int 20x^3(5x^4 - 3)^4 \, dx$$

$$38) \int -\sin x \cdot \cos^5 x \, dx$$

Evaluate each definite integral.

$$39) \int_1^4 \left(\frac{x^2}{2} - 4x + 9 \right) dx$$

$$40) \int_0^3 (-x^3 + 4x^2 - 7) dx$$

$$41) \int_0^4 -5(x-2)^{\frac{1}{3}} dx$$

Evaluate the limits.

$$42) \lim_{x \rightarrow -3} (2x + 5)$$

$$43) \lim_{x \rightarrow -\frac{\pi}{2}} 2\cos(2x)$$

$$44) \lim_{x \rightarrow -1} (x^2 + 8x + 12)$$

$$45) \lim_{x \rightarrow 2} \frac{x+2}{x^2-4}$$

$$46) \lim_{x \rightarrow 1} \frac{x^2 - 4x + 3}{x - 1}$$

$$47) \lim_{x \rightarrow \infty} \frac{2x}{x-3}$$

$$48) \lim_{x \rightarrow -\infty} (e^{2x} + 3)$$

$$49) \lim_{x \rightarrow -1} \frac{1}{x+1}$$

$$50) \lim_{x \rightarrow -1^-} -\frac{1}{x+1}$$

Answers to SUMMER PACKET!

1) $f'(x) = -6x$

3) $f'(x) = -1$

5) $f'(x) = 0$

7) $f'(x) = \frac{1}{4}x^{-\frac{3}{4}} - 8x^{-3}$

9) $\frac{dy}{dx} = -144x^8 + 80x^4 - 48x^3$

11) $\frac{dy}{dx} = \frac{5x^8 + 50x^4}{x^8 + 4x^4 + 4}$

13) $f'(x) = -4(2x^3 + 5)^{-5} \cdot 6x^2$

15) $f'(x) = \frac{1}{2}(5x^5 + 2)^{-\frac{1}{2}} \cdot 25x^4$

17) $f'(x) = \cos 4x^5 \cdot 20x^4$

19) $\frac{dy}{dx} = \sec^2 2x^3 \cdot 6x^2$

21) $f'(x) = e^{x^3} \cdot 3x^2$

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

25) $\frac{dy}{dx} = \frac{6x^2}{9y^2 + 10y}$

27) $y = -x + 1$

29) $3x^6 + 4x^3 + C$

31) $3x^{\frac{7}{5}} + C$

33) $2\cos x + C$

35) $-5\ln|x| + C$

37) $\frac{1}{5}(5x^4 - 3)^5 + C$

39) $\frac{15}{2} = 7.5$

41) 0

43) -2

45) $-\frac{1}{4}$

47) 2

49) Does not exist.