

September 21, 2026

National Pecan Cookie Day

Today in History:

Benedict Arnold commits treason (1780)

Number of the Day: 3604

$$3604 = 2 \times 2 \times 17 \times 53$$

3604 and its reversal (4063) are each multiples of 17.

Fun Fact:

In Halethrope, Maryland kisses longer than one second are illegal.

Quote of the Day:

“Life expectancy would grow by leaps and bounds if green vegetables smelled as good as bacon.”

-Doug Larson

Today's Weather:

Overcast. High 66°

Math 121

Quiz #13

Find $f'(x)$ for

$$f(x) = 4x^7 - \frac{3}{x^2} + 12\sqrt{x}$$

$$f(x) = 4x^7 - 3x^{-2} + 12x^{\frac{1}{2}}$$

$$f'(x) = 4(7x^6) - 3(-2)x^{-3} + 12\frac{1}{2}x^{-\frac{1}{2}}$$

$$f'(x) = 28x^6 + 6x^{-3} + 6x^{-\frac{1}{2}}$$

$$= 28x^6 + \frac{6}{x^3} + \frac{6}{\sqrt{x}}$$

DERIVATIVE RULES

FUNCTION

C

x^N

$C f(x)$

$f(x) \pm g(x)$

e^x

DERIVATIVE

0

$N x^{N-1}$

$C f'(x)$

$f'(x) \pm g'(x)$

e^x

① $f(x) = x^2 + 3x$

$$f'(x) = 2x + 3$$

② $f(x) = 1 + \frac{1}{x}$
 $= 1 + x^{-1}$

$$f'(x) = 0 + -1x^{-2}$$
$$= -\frac{1}{x^2}$$

③ $f(x) = \sqrt[3]{x}$
 $= x^{\frac{1}{3}}$

$$f'(x) = \frac{1}{3} x^{-\frac{2}{3}}$$
$$= \frac{1}{3 \sqrt[3]{x^2}}$$

④ $f(x) = e^{x+2}$
 $= e^x e^2$

$$f'(x) = e^2 e^x$$
$$= e^{x+2}$$

⑤ $f(x) = \sqrt[5]{\frac{1}{x^2}} = x^{-\frac{2}{5}}$

$$f'(x) = -\frac{2}{5} x^{-\frac{7}{5}}$$
$$= \frac{-2}{5 \sqrt[5]{x^7}}$$

$$\textcircled{6} \quad f(x) = (x^2+1)(x^3+3x)$$

$$\begin{aligned} f(x) &= x^5 + 3x^3 + x^3 + 3x \\ &= x^5 + 4x^3 + 3x \end{aligned}$$

$$f'(x) = 5x^4 + 12x^2 + 3$$

$$\textcircled{7} \quad f(x) = \frac{x^4 + x^7}{x^6}$$

$$= \frac{x^4}{x^6} + \frac{x^7}{x^6}$$

$$= \frac{1}{x^2} + x$$

$$= x^{-2} + x$$

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

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

$$\textcircled{8} \quad f(x) = (x^2+x+1)^2 \quad \leftarrow$$

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

$$= x^4 + x^3 + x^2 + x^3 + x^2 + x + x^2 + x + 1$$

$$= x^4 + 2x^3 + 3x^2 + 2x + 1$$

$$f'(x) = 4x^3 + 6x^2 + 2x + 2$$

THM

IF $f(x)$ IS DIFF. (HAS A DERIVATIVE)
THEN $f(x)$ IS CONT.

$$f'(a) = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$$

$$= \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$$

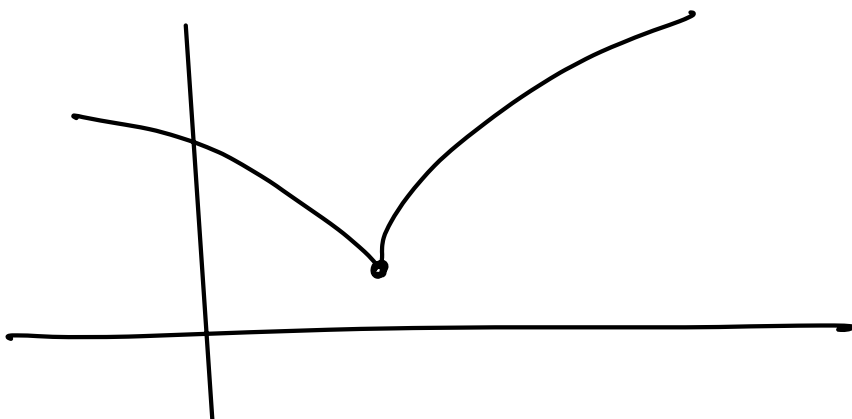
$$\lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a} (x - a)$$

$f'(a) \cdot 0 = 0$

$$\lim_{x \rightarrow a} \frac{f(x) - f(a)}{\cancel{x - a}} \cancel{(x - a)} = 0$$

$$\lim_{x \rightarrow a} f(x) - f(a) = 0$$

$$\boxed{\lim_{x \rightarrow a} f(x) = f(a)}$$

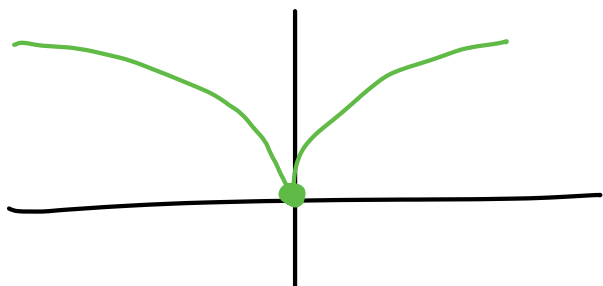


$$\underline{\underline{f(x) = x^{\frac{2}{3}}}}$$

$$f'(x) = \frac{2}{3} x^{-\frac{1}{3}}$$

$$= \frac{2}{3 \sqrt[3]{x}}$$

$$x=0$$



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

$$f'(x) = \frac{1}{3} x^{-\frac{2}{3}}$$

$$= \frac{1}{3 \sqrt[3]{x^2}}$$

