AP Calculus AB

Please get a white board and pen from the back table

On your whiteboards, write but do not solve, an indefinite integral problem that you know how to integrate.

Ex:

$$\int \sqrt[4]{x^3}\,dx$$

Exchange boards with your face partner and solve their problem.

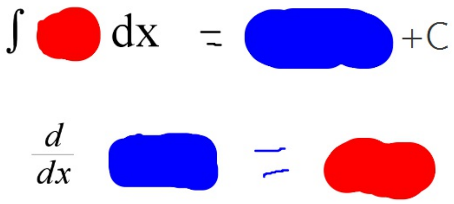
Check your partner's solution by taking the derivative of their answer.

Discuss with your elbow partner:

- something you learned in doing this problem
- something you are still confused about related to integrals

Homework solutions

Are not needed! Just take the derivative of your answer and see if you get what the book had as the integrand.

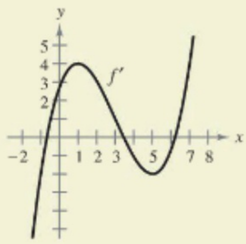


50.

a. -1. f ' (4) = -1, and f ' is slope of f.
b. Yes. We don't know where
the original function f goes through.
c. No. f(5) - f(4) > 0 implies
f(5) > f(4).
But since f ' is negative over [4,5], f
is decreasing over [4,5]. So f(5)<f(4)

d. x = 3.5 f' changes from + to -
e. CU: (-inf, 1) (5, inf)   IP: x = 1, 5
CD: (1,5)

50. HOW DO YOU SEE IT? Use the graph of f' shown in the figure to answer the following.



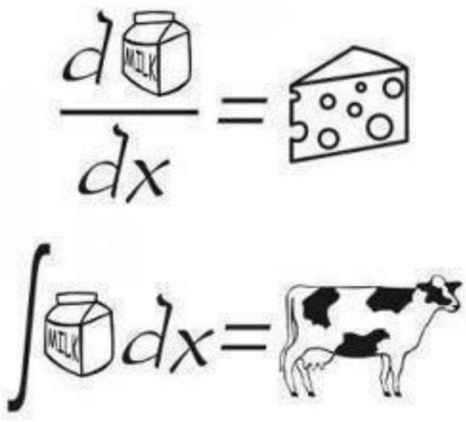
(a) Approximate the slope of f at $x = 4$. Explain.

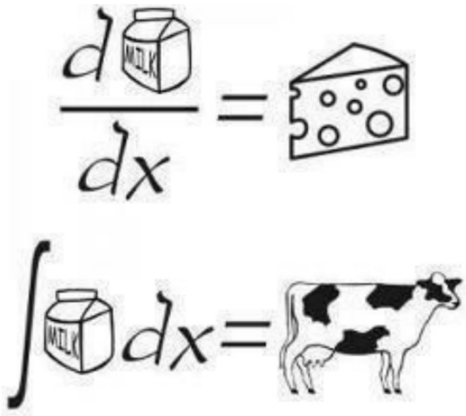
(b) Is it possible that $f(2) = -1$? Explain.

(c) Is $f(5) - f(4) > 0$? Explain.

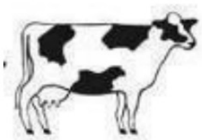
(d) Approximate the value of x where f is maximum. Explain.

(e) Approximate any open intervals in which the graph of f is concave upward and any open intervals in which it is concave downward. Approximate the x-coordinates of any points of inflection.


d
MILK
dx
MILK
dx

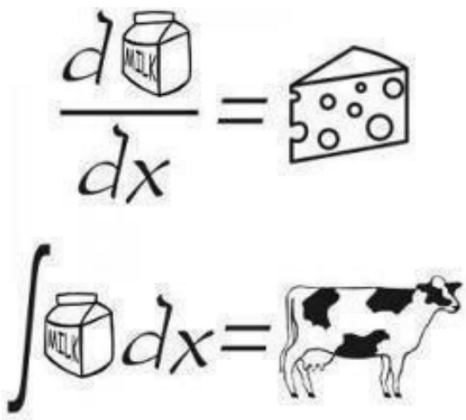


What is

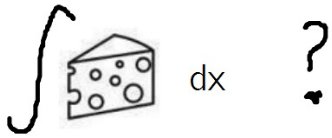
$\frac{d}{dx}$ 

answer on white boards

cow - position
milk - velocity
cheese - accelera



What is



answer on white boards

Do in your head and vote with white board:

What is dy/dx?

$$y = (-4x^5 - 5)^2$$

A) $\frac{dy}{dx} = (-4x^5 - 5) \cdot -20x^4$

B) $\frac{dy}{dx} = -40x^4(-4x^5 - 5)$

E. wat

C) $\frac{dy}{dx} = 2(-4x^5 - 5)$

D) $\frac{dy}{dx} = -20x^4$

What is dy/dx?

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

A) $\frac{dy}{dx} = 5(4x^3 + 5)^4$

B) $\frac{dy}{dx} = (4x^3 + 5)^4 \cdot 12x^2$

C) $\frac{dy}{dx} = 12x^2$

D) $\frac{dy}{dx} = 60x^2(4x^3 + 5)^4$

NOTES:
When you do the chain rule, what does the answer look like?

$$\frac{d}{dx}\left[(\text{math stuff})^{100}\right] = 100(\text{math stuff})^{99} \cdot \left(\text{deriv. of math stuff}\right)$$

$$\int 100(\text{math stuff})^{99} \cdot \left(\text{deriv. of math stuff}\right) dx = \left[(\text{math stuff})^{100}\right] + C$$

ex/

$$\frac{1}{2}\int 2x\,(x^2+1)^5\,dx$$

$$\frac{1}{2}\left[\frac{(x^2+1)^6}{6}+C\right]$$

$$\frac{1}{2}\left[\frac{1}{6}(x^2+1)^6+C\right]$$

$$\boxed{\frac{1}{12}(x^2+1)^6+C}$$

$$\frac{1}{12}(x^2+1)^6+C$$

$$\frac{6}{12}(x^2+1)^5\cdot 2x$$

$$\frac{1}{2}(x^2+1)^5\cdot 2x$$

$$x(x^2+1)^5$$

ex/ $\int 3x^2\sqrt{2x^3-4}\cdot dx$

$\frac{1}{2}\int 2\cdot 3x^2(2x^3-4)^{1/2}\cdot dx$

$\frac{1}{2}\int 6x^2(2x^3-4)^{1/2}\cdot dx$

$\frac{1}{2}\left[\frac{(2x^3-4)^{3/2}}{3/2}\right]+c$

$\frac{2}{3}(2x^3-4)^{3/2}$

$\frac{1}{3}(2x^3-4)^{3/2}+C$

extra Example

$$\int \frac{x^4}{(x^5-3)^3}\,dx$$

rewrite

$$\int x^4 \cdot (x^5-3)^{-3}\,dx$$

cheat

$$\frac{1}{5}\int 5x^4 \cdot (x^5-3)^{-3}\,dx$$

$$\frac{1}{5}\int 5x^4 (x^5-3)^{-3}\,dx$$

focus on antiderivative of this part.

$$\frac{1}{5}\left[\frac{(x^5-3)^{-2}}{-2} + C\right]$$

$$\frac{1}{5}\left[-\frac{1}{2}(x^5-3)^{-2} + C\right]$$

$$\boxed{-\frac{1}{10}(x^5-3)^{-2} + C}$$

Check answer:

$$\frac{d}{dx}\left[-\frac{1}{10}(x^5-3)^{-2} + C\right]$$

$$-\frac{1}{10}\cdot -2(x^5-3)^{-3}\cdot 5x^4 + 0$$

$$\frac{1}{5}(x^5-3)^{-3}\cdot 5x^4$$

$$x^4(x^5-3)^{-3}$$

Hurray!