Monday Assess reminder:

I-U4: Applying FTC 1 (front of worksheet, #1-8)

I-U7: Definite integral properties (p. 274 hw)

I-A7a: Average Value (p 288 hw)

I-A4b: Area Between Curves (worksheets)

$$\frac{1}{b-a}\int_a^b f(x)\,dx$$

Last call for scantrons! We will be going over it later today!!!

Area Between Curves HW

1) $\int_{-2}^{0}\left(\frac{x^3}{2}-x^2-4x\right)dx+$
$\int_{0}^{4}\left(x-\left(\frac{x^3}{2}-x^2-3x\right)\right)dx$
$=\frac{74}{3}\approx 24.667$

2) $\int_{-2}^{0}\left(-x^2-\left(-2x^3-3x^2+4x\right)\right)dx+$
$\int_{0}^{1}\left(-2x^3-3x^2+4x+x^2\right)dx$
$=\frac{37}{6}\approx 6.167$

3) $\int_{-3}^{0}\left(\frac{x^3}{2}+\frac{x^2}{2}-\frac{5x}{2}-\frac{x}{2}\right)dx+$
$\int_{0}^{2}\left(\frac{x}{2}-\left(\frac{x^3}{2}+\frac{x^2}{2}-\frac{5x}{2}\right)\right)dx$
$=\frac{253}{24}\approx 10.542$

4) $\int_{-2}^{0}\left(x^3-4x\right)dx+$
$\int_{0}^{2}\left(x^2-\left(x^3+x^2-4x\right)\right)dx$
$=8$

5) $\int_{-2}^{1}\left(y+4-\left(y^2+2y+2\right)\right)dy$
$=\frac{9}{2}=4.5$

6) $\int_{0}^{4}\left(2\sqrt{y}-\frac{y^2}{4}\right)dy$
$=\frac{16}{3}\approx 5.333$

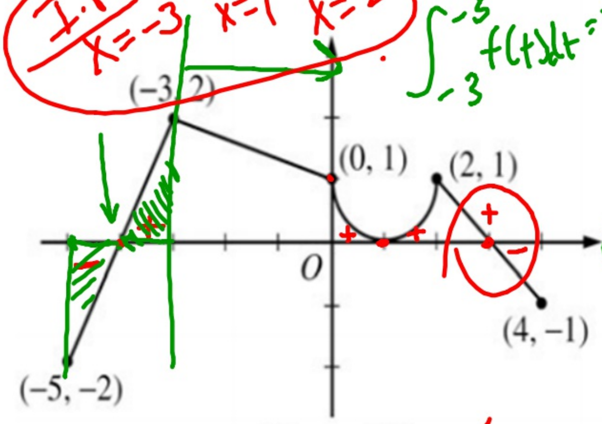
7) $\int_{-3}^{0}\left(\frac{y^3}{2}+\frac{y^2}{2}-\frac{5y}{2}-\frac{y}{2}\right)dy+$
$\int_{0}^{2}\left(\frac{y}{2}-\left(\frac{y^3}{2}+\frac{y^2}{2}-\frac{5y}{2}\right)\right)dy$
$=\frac{253}{24}\approx 10.542$

8) $\int_{-3}^{0}\left(y^3+y^2-6y\right)dy+$
$\int_{0}^{2}\left(2y-\left(y^3+y^2-4y\right)\right)dy$
$=\frac{253}{12}\approx 21.083$

FTC in action: 2004AB5 no calc (flip side of the water tank problem)

I.P. $x=-3$, $x=1$, $x=2$

$\int_{-3}^{-5} f(t)\,dt = 0$



Graph of f = g'

The graph of the function f shown above consists of a semicircle and three line segments. Let g be the function given by $g(x) = \int_{-3}^{x} f(t)\,dt$.

$\frac{d}{dx} g(x) = \frac{d}{dx}\int_{-3}^{x} f(t)\,dt$

$g'(x) = f(x)$

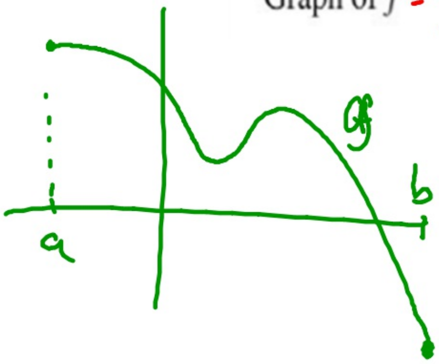
$g'(x) = f(x).$

(a) Find $g(0)$ and $g'(0)$.

(b) Find all values of x in the open interval $(-5, 4)$ at which g attains a relative maximum. Justify your answer.

(c) Find the absolute minimum value of g on the closed interval $[-5, 4]$. Justify your answer.

(d) Find all values of x in the open interval $(-5, 4)$ at which the graph of g has a point of inflection.



$g'' = f'$

$g = \int f$

$g' = f$

$g'' = f'$

$g''' = f''$

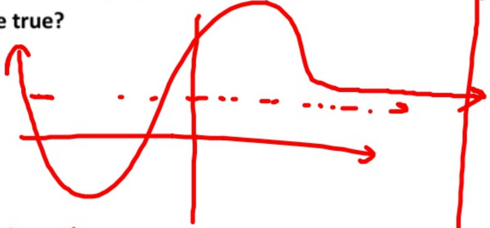
$g^{n+1} = f^{n}$

2003 Test

Most commonly missed: 3, 9, 20, 22, 27, 28

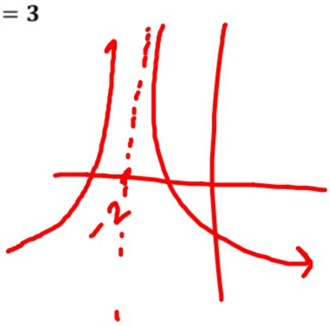
3 **For $x \geq 0$, the horizontal line $y = 3$ is an asymptote for the graph of the function f. Which of the following statements must be true?**

A) $f(0) = 3$
B) $f(x) \neq 3$ for all $x \geq 0$
C) $f(3)$ is undefined.
D) $\lim_{x \to 3} f(x) = \infty$
E) $\lim_{x \to \infty} f(x) = 3$



$$\boxed{y = a \text{ is an H.A if } \lim_{x \to \infty} f(x) = a}$$

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



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

$$\lim_{x \to \infty} \frac{5x^8 \cdots}{2x^8 \cdots}$$

9. **If $f(x) = ln(x + 5 + e^{-5x})$, then $f'(0)$ is**

A) -3

B) $\frac{1}{6}$

C) $-\frac{2}{3}$

D) $\frac{2}{3}$

E) *nonexistent*

Chain Rule.

$$f' = \frac{1}{x+5+e^{-5x}} \cdot (1 + 0 - 5e^{-5x})$$

$$\frac{1}{0+5+\cancel{e^{-5 \cdot 0}}_{1}} (1 + 0 - 5\,\cancel{e^{-5 \cdot 0}}^{1})$$

$$\frac{1}{6} \cdot -4$$

$$f(x) = \begin{cases} x + 2 & \text{if } x \le 3 \\ 4x - 7 & \text{if } x > 3 \end{cases}$$

$f(x) = \begin{cases} 5 \\ 5 \end{cases}$ $\quad f'(x) = \begin{cases} 1 \\ 4 \end{cases}$

20. Let *f* be the function given above. Which of the following statements about *f is false*?

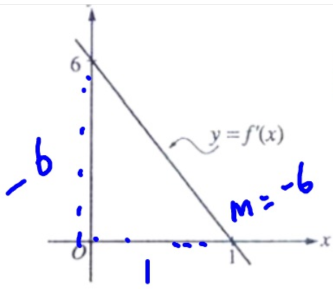
I. $\lim_{x \to 3} f(x)$ exists. ✓ Roads meet

II. f is continuous at $x = 3$. ✓ Roads meet @ bridge

III. f is differentiable at $x = 3$. X " " + "smooth"

A) None
B) I only
C) II only
D) III only
E) I and II only

"Finding C"



$y = mx + b$

$-6x + 6$

$\int f'(x) = \int -6x + 6$

22. The graph of f', the derivative of f, is the line shown in the figure above. If $f(0) = 4$ then $f(1) =$

(0, 4)

A) 0
B) 3
C) 4
D) 7
E) 11

$f(x) = -3x^2 + 6x + C$

$4 = 0 + 0 + c$

$4 = c$

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

27. Let f be the function defined by $f(x) = x^3 + x$. If $g(x) = f^{-1}(x)$ and $g(29) = 2$, what is the value of $g'(29)$?

Deriv. of Inverses

A) 13

B) $\frac{1}{13}$

C) $\frac{2}{29}$

D) $\frac{1}{2}$

E) $\frac{29}{2}$

$$\frac{d}{dx} f(g(x)) = \frac{d}{dx} x$$

$$f'(g(x))\, g'(x) = 1$$

$$g'(29) = \frac{1}{f'(g(29))} \quad g(29) = 2$$

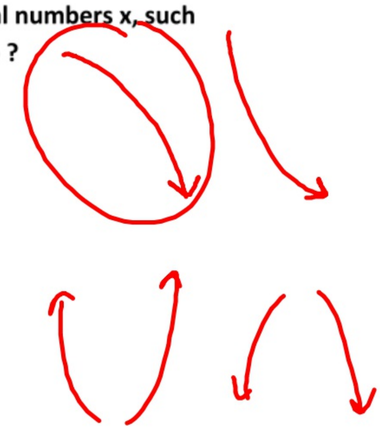
$$f' = 3x^2 + 1$$

$$\frac{1}{13}$$

28. Let g be a twice-differentiable function with $g'(x)<0$ and $g''(x)<0$ for all real numbers x, such that $g(4)=12$ and $g(5)=9$. Of the following which is a possible value of $g(6)$?

g dec. g C.D.

~~A) 15~~
~~B) 12~~
~~C) 9~~
D) 6
E) 3



10 minutes to look over and discuss ones that you missed, make corrections, talk about it with your table and classmates and/or me.

Feel free to move around, help each other out, and collaborate.

2003 Yes Calculator section!

Skip #86 (don't know how to do it yet)

Homework:

- Assessment on Monday; study, look over related hw!
- Work on AP test practice; due Wednesday