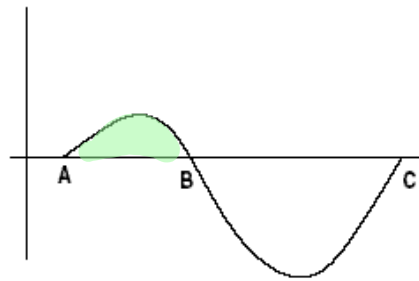


Week in Review # 9  
 Sections 5.5, 7.1, 7.2

1. Use the graph is of  $f'(x)$  to determine which of these two values are the largest.



$$\int_a^b f'(x) dx = f(b) - f(a)$$

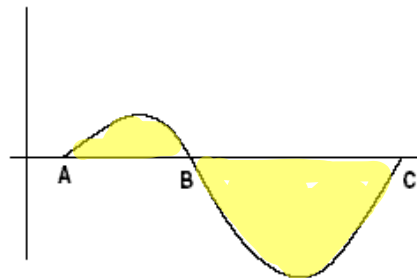
(a)  $f(a)$  or  $f(b)$

$$\int_a^b f'(x) dx = f(b) - f(a)$$

positive

↑ Bigger since  
 $f(b) - f(a) > 0$   
 implies  $f(b) > f(a)$

(b)  $f(a)$  or  $f(c)$



$$\int_a^c f'(x) dx = f(c) - f(a)$$

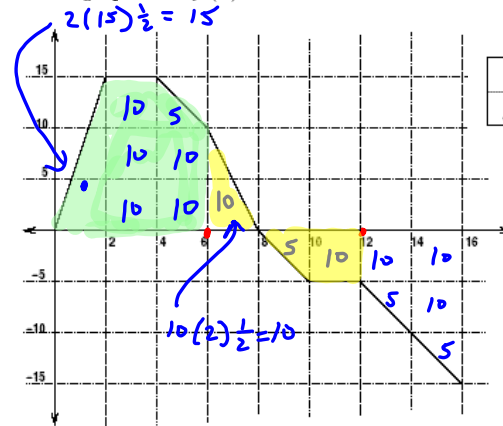
neg. result

Since more  
 Area below

$$f(c) - f(a) < 0$$

$$f(c) < f(a)$$

2. The graph is of  $f'(x)$ . Fill in the table values for  $f(x)$  given that  $f(6) = 100$



x	0	2	4	12	14	16
$f(x)$	30	45	75	95	80	55

$$\int_0^6 f'(x) dx = f(6) - f(0)$$

evaluate  $\int$  with graph.

$$70 = f(6) - f(0)$$

$$70 = 100 - f(0)$$

$$-30 = -f(0)$$

$$30 = f(0)$$

$$\int_0^2 f'(x) dx = f(2) - f(0)$$

$$15 = f(2) - 30$$

$$45 = f(2)$$

$$\int_2^4 f'(x) dx = f(4) - f(2)$$

$$30 = f(4) - 45$$

$$75 = f(4)$$

$$\int_6^{12} f'(x) dx = f(12) - f(6)$$

$$-5 = f(12) - 100$$

$$95 = f(12)$$

$$\int_{12}^{14} f'(x) dx = f(14) - f(12)$$

$$-15 = f(14) - 95$$

$$80 = f(14)$$

$$\int_{14}^{16} f'(x) dx = f(16) - f(14)$$

$$-25 = f(16) - 80$$

$$55 = f(16)$$

3. Which of these is an antiderivative of  $f'(x) = 4xe^{2x}$  ?

~~(a)~~  $f(x) = 2x^2e^{2x} + xe^{2x} + C$

(b)  $f(x) = 2xe^{2x} - e^{2x} + C$

(c)  $f(x) = (2x - 1)e^{2x}$   
 $= 2xe^{2x} - e^{2x} + 0$

take deriv. +  
see which gets  
result of  $4xe^{2x}$ .

a)  $f'(x) = 4xe^{2x} + 2x^2 \cdot 2 \cdot e^{2x} + 1e^{2x} + x \cdot 2 \cdot e^{2x} + 0$   
 $= 4xe^{2x} + 4x^2e^{2x} + e^{2x} + 2xe^{2x}$   
 $= 6xe^{2x} + 4x^2e^{2x} + e^{2x}$

will not simplify to  $4xe^{2x}$  so not  
an anti deriv.

b)  $2e^{2x} + 2x \cdot 2e^{2x} - 2e^{2x} + 0$   
 $= 4xe^{2x}$   
yep.

c) works since we are taking the  
deriv. to get  $4xe^{2x}$ .

4. Find  $f(x)$  if  $f'(x) = 6e^{2x} + 8 \sin(2x)$  and  $f(0) = 20$

$$\int e^{2x} dx = \frac{1}{2} e^{2x} + C$$

$$\int \sin(2x) dx = -\frac{1}{2} \cos(2x) + C$$

$$f(x) = \frac{6}{2} e^{2x} + -\frac{8}{2} \cos(2x) + C$$

$$= 3e^{2x} - 4 \cos(2x) + C$$

$$20 = f(0) = 3e^0 - 4 \cos(0) + C$$

$$20 = 3 - 4 + C$$

$$20 = -1 + C$$

$$21 = C$$

$$f(x) = 3e^{2x} - 4 \cos(2x) + 21$$

5. Compute these integrals.

$$(a) \int 7x^4 + 5x^3 + 8 dx = \frac{7x^5}{5} + \frac{5x^4}{4} + 8x + C$$

$$(b) \int 3x^2 dw = 3x^2 w + C$$

variable  
is  $w$

$$(c) \int 5x + \frac{5}{x} + \frac{6}{x^4} dx = \int 5x + 5x^{-1} + 6x^{-4} dx$$
$$= \frac{5x^2}{2} + 5 \ln|x| + \frac{6x^{-3}}{-3} + C$$

$$\int x^{-2} dx = \frac{x^{-1}}{-1} + C = -\frac{1}{x} + C$$

$$\begin{aligned} \text{(d)} \int \frac{1}{e^{3x}} + \frac{1}{4x} dx &= \int e^{-3x} + \frac{1}{4} x^{-1} dx \\ &= \frac{1}{-3} e^{-3x} + \frac{1}{4} \ln|x| + C \end{aligned}$$

$$\begin{aligned} \text{(e)} \int x^2 \sqrt{x} dx &= \int x^2 \cdot x^{.5} dx = \int x^{2.5} dx \\ &= \frac{x^{3.5}}{3.5} + C \end{aligned}$$

$$\text{(f)} \int 6 \cos(3x) + e dx = \frac{6}{3} \sin(3x) + e \cdot x + C$$

↑  
just a #.

$$\begin{aligned} \int \cos(kx) dx \\ = \frac{1}{k} \sin(kx) + C \end{aligned}$$

$$(g) \int 4x^3(1+2x^4)^8 dx = \int 4u^8 x^3 dx$$

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

$$\frac{du}{dx} = 8x^3$$

$$\frac{du}{8} = x^3 dx$$

$$= \int 4u^8 \frac{1}{8} du$$

$$= \int \frac{1}{2} u^8 du$$

$$= \frac{1}{2} \frac{u^9}{9} + C$$

$$= \frac{1}{18} (1+2x^4)^9 + C$$

(junk)<sup>power</sup>

e<sup>junk</sup>

something  
junk

sin(junk)

cos(junk)

Let

u = junk

$$(h) \int \frac{x^4}{\sqrt{x^5+5}} dx = \int \frac{1}{u^{1/2}} \cdot \frac{du}{5} = \int \frac{1}{5} u^{-1/2} du$$

$$u = x^5 + 5$$

$$\frac{du}{dx} = 5x^4$$

$$du = 5x^4 dx$$

$$\frac{du}{5} = x^4 dx$$

$$= \frac{1}{5} \cdot \frac{u^{1/2}}{1/2} + C$$

$$= \frac{2}{5} u^{1/2} + C$$

$$= \frac{2}{5} (x^5 + 5)^{1/2} + C$$



$$(i) \int \underline{(8x^3 + 14)} \sin(x^4 + 7x) dx = \int 2(4x^3 + 7) \sin(u) dx$$

$$u = x^4 + 7x$$

$$\frac{du}{dx} = 4x^3 + 7$$

$$du = \underline{(4x^3 + 7) dx}$$

$$= \int 2 \sin(u) du$$

$$= -2 \cos(u) + C$$

$$= -2 \cos(x^4 + 7x) + C$$

$$(j) \int \sin(2x) (\cos(2x) + 10)^7 dx = \int -\frac{1}{2} u^7 du$$

$$u = \cos(2x) + 10$$

$$\frac{du}{dx} = -2 \sin(2x)$$

$$\frac{du}{-2} = \sin(2x) dx$$

$$\uparrow -\frac{1}{2} du$$

$$= -\frac{1}{2} \frac{u^8}{8} + C$$

$$= -\frac{1}{16} (\cos(2x) + 10)^8 + C$$

$$(k) \int \frac{12xe^{x^2}}{1+e^{x^2}} dx = \int \frac{12}{u} \frac{du}{2} = \int \frac{6}{u} du$$

$$u = 1 + e^{x^2}$$

$$\frac{du}{dx} = 2xe^{x^2}$$

$$\frac{du}{2} = xe^{x^2} dx$$

$$= \int 6u^{-1} du$$

$$= 6 \ln |u| + C$$

$$= 6 \ln (1 + e^{x^2}) + C$$

$$(1) \int 12 \sin(6x+7) \cos(6x+7) dx = \int 12 u \frac{du}{6} = \int 2u du$$

$$u = \sin(6x+7)$$

$$\frac{du}{dx} = 6 \cos(6x+7)$$

$$= u^2 + C$$

$$= (\sin(6x+7))^2 + C$$

$$\frac{du}{6} = \cos(6x+7) dx$$

$$u = \cos(6x+7)$$

$$\frac{du}{dx} = -6 \sin(6x+7)$$

$$\frac{du}{-6} = \sin(6x+7) dx$$

$$= \int 12 u \frac{du}{-6} = \int -2u du$$

$$= -u^2 + C$$

$$= -(\cos(6x+7))^2 + C$$