Math 142 Fall 2019 - Weak 3 - Review-Midterm

2/5/2020 -

Feel free to ask me question!

Here's what you need to know to get the perfect grade.

critical pt. local max / min.

(1) 5.6 Optimization: Be familiar with these two problems.

(a) Example: Suzie can sell 20 bracelets each day when the price is \$10 for a bracelet. If she raises the price by \$1, then she sells 2 fewer bracelets each day. If it costs \$8 to make each bracelet, find the selling price that will maximize Suzies profit. $\boxed{\$14}$

maximize Suzie's profit.

If x is critical pt, of f(x), and $f''(x)<0$ $\Rightarrow$ f(x) is local max.

$f''(x)>0$ $\Rightarrow$ f(x) is local min

$\boxed{R''(p)=-4}$ <0 $\Rightarrow$

$\boxed{R(x)}=(\text{price}-\text{Cost})\cdot\text{quantity}$ (net price) $= \text{price}\cdot\text{quantity} - \text{total cost}$.

$\boxed{=-2p+40}$

$Q=Q(P)$

$R(p)=(p-8)Q(p)$

$=(p-8)(-2p+40)$

$=-2p^2+16p+40p-320$

dom $R(p)=\boxed{[0,\infty)}$

$R'(x)=-4p+56$

Critical values.

$R'(x)=0$ or DNE.

$-4p+56=0 \Rightarrow 4p=56 \Rightarrow \boxed{p=14}$ ← critical value

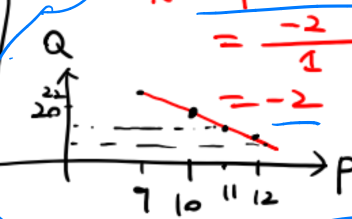
Q	P
20	\$10
18	\$11
16	\$12

$R(14)=(14-8)(-28+40)$
$=6\cdot 12=72\$$

$R(0)=0$

$\boxed{\text{Selling price}=14\$}$

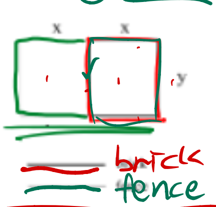
* Slope of Q(P) $=\frac{-2}{1}=-2$



$Q=-2(p-10)+20$

$\boxed{Q=-2p+40}$

(b) Example: Ben needs to enclose two rectangular regions that share one side, and each has an area of 1400 ft². One of the regions needs to be enclosed on all four sides by a brick wall, and the other region just needs fencing on its remaining three sides (see diagram below). The brick wall costs \$18 per foot, and the fencing costs \$6 per foot. Find the dimensions of each region that would be the most economical for Ben.



$C(x)=(2x+2y)\cdot 18+(2x+y)\cdot 6$

Minimize $C(x)$.

s.t. $\boxed{xy=1400\ ft^2}$, $y=\frac{1400}{x}$,

$C(x)=(2x+2\cdot\frac{1400}{x})\cdot 18+(2x+\frac{1400}{x})\cdot 6$

$=36x+\frac{1400\cdot 36}{x}+12x+\frac{6\cdot 1400}{x}$.

$=48x+\frac{1400}{x}(36+6)$

$=48x+\frac{42\cdot 1400}{x}$.

Minimize $\boxed{C(x)=48x+\frac{42\cdot 1400}{x}}$

s.t. $\boxed{x\geq 0}$ $(0,\infty)$

$\Rightarrow \boxed{C'(x)=48-42\cdot 1400\cdot x^{-2}}$

$x=\frac{35}{\sqrt{2}}$

$y=\frac{1400}{2\cdot\frac{35}{\sqrt{2}}}=\dots$

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

Find x where $C'(x)=0$ or DNE $\Rightarrow$ $48 - 42 \cdot 1400 \cdot x^{-2} = 0$

$48 = 21 \cdot 1400 x^{-2}$

$48x^2 = 42 \cdot 1400$

$x^2 = \frac{42 \cdot 1400}{48}$

$x = \pm \frac{\sqrt{42 \cdot 1400}}{\sqrt{48}}$

$= \pm \frac{\sqrt{3} \cdot 140}{\sqrt{3} \cdot 4} = \pm \frac{140}{4} = \boxed{\pm 35}$

35.

$\sqrt{48} = \sqrt{3 \cdot 16} = \sqrt{3} \cdot \sqrt{16} = 4\sqrt{3}$

$42 = 3 \cdot 7 \cdot 2$ $48 = 2^4 \times 3$

$1400 = 2 \cdot 7 \cdot 10 \cdot 10$

$42 \cdot 1400 = 3 \cdot 2^2 \cdot 7^2 \cdot 10^2$

$\sqrt{\quad ''} = \sqrt{3} \cdot 2 \cdot 7 \cdot 10$

3

5.6 problems.

1. Find an equation.

(1) it is function of price on quantity ...

revenue = (price − cost) # of product

product = function of price

(2) two variables x, y but there is some relationship between x, y.

Critical value $= +35$

(because -35 is not in the domain)

$C''(35) = 84 - 1400 \cdot \frac{1}{(\frac{35}{52})^3}$ $\boxed{>0}$

$\Rightarrow$ By second derivative test, C has local minima on $x = 35$

$C''(x) = -21 \cdot 1400 \cdot x^{-3}(-2)$

$= 42 \cdot 1400\, x^{-3}$

$\Rightarrow$ Since $x = 35$ is the only critical value and there is no boundary points, It is absolute minima

$x = 35$. $y = \frac{\cancel{1400}\ \cancel{200}\ 40}{\cancel{35}\ \cancel{5}\ 1} = 40$

Ex2

$C(x,y)$

$\boxed{xy = 1400}$

$y = \frac{1400}{x}$

2. Find critical values

3. Derivative second derivative

4. Second derivative test & conclude local max or local min

(2) 6.1 Antiderivatives

(a) ***Antiderivative*** of a function $f(x)$: a function $F(x)$ such that $\boxed{F'(x)} = \boxed{f(x)}$.

(b) ***Indefinite integral:*** $\boxed{\int f(x)dx} = F(x) + C$ such that C is constant, F is an antiderivative.

(c) Properties of indefinite integral: For constant C and k,

(i) $\int x^n dx = \frac{1}{n+1}x^{n+1} + C$, where $n \neq -1$

(ii) $\int k dx = kx + C$

(iii) $\int e^x dx = e^x + C$

(iv) $\int \frac{1}{x} dx = \ln|x| + C$, where $x \neq 0$

(v) $\int kf(x)dx = k \int f(x)dx$

(vi) $\int [f(x) \pm g(x)]dx = \int f(x)dx \pm \int g(x)dx$

$(\ln|x|)' = \frac{1}{x}$ $n=-1$ (1) $\int x^n dx = \frac{1}{n+1}x^{n+1}$ $\frac{1}{0}\cdot x^0$

(d) Example2, i): Find an indefinite integral $\int \frac{4u+u^3-3u^{-7}}{5u^2}du$

$$= \int\left(\frac{4u}{5u^2} + \frac{u^3}{5u^2} - \frac{3u^{-7}}{5u^2}\right)du = \int\left(\frac{4}{5}u^{-1} + \frac{u}{5} - \frac{3}{5}u^{-9}\right)du$$

(6) $= \int \frac{4}{5}u^{-1}du + \int \frac{u}{5}du + \int\left(-\frac{3}{5}\right)u^{-9}du \overset{(5)}{=} \frac{4}{5}\int u^{-1}du + \frac{1}{5}\int u\,du - \frac{3}{5}\int u^{-9}du$ (4) (1) (1)

$$= \frac{4}{5}(\ln|u| + C) + \frac{1}{5}(u^2 + C) - \frac{3}{5}\frac{1}{-9+1}\cdot u^{-8}$$

$$= \frac{4}{5}\ln|u| + \frac{1}{5}u^2 + \frac{3}{40}u^{-8} + C$$

(e) Example4: The marginal revenue of selling x watches each day is given by $R'(x) = 30 - 0.0003x^2$ dollars per watch for $0 \le x \le 540$. If the revenue is \$1487.50 when 50 watches are sold, find the revenue function.

① $R(50) = 1487.50$

$R(x) = 30x - 0.0001x^3$

(1) $\int R'(x)dx = \int(30 - 0.0003x^2)dx \overset{(6)}{=} \int 30dx + \int -0.0003x^2dx$ (2) (5)

① Find an antiderivative using indefinite integral

$= 30x + C - 0.0003\int x^2 dx$ (1)

② Plug in the given value of $R(x)$

$= 30x + C - 0.0003\left(\frac{1}{2+1}x^{2+1} + C\right)$

plug in (2) 50 into r $r(x) = 30x - 0.0001x^3 + C$

$1487.5 = r(50) = 30\cdot 50 - 0.0001\cdot 50^3 + C = 1487.50$ $\Rightarrow C = 0$

Example 5: A sculpture purchased by a museum for \$50,000 increases in value at a rate of $V'(t) = 100e^t$ dollars

(f) Also see Example 5 in the previous lecture notes.

(3) 6.2: Substitution

(a) Reversing the chain rule!

(b) Example 1: $\boxed{\int e^{\underbrace{x^3-1}_{=u}} \cdot \boxed{3x^2dx}} = \int e^u du = e^u + C$

$u = x^3 - 1$ $\quad = e^{x^3-1} + C$

$du = \boxed{3x^2 \cdot dx}$

$du = f'(x)dx$

(c) General Indefinite Integral Formulas

(i) $\int (\underbrace{f(x)}_{u})^n \cdot f'(x)dx = \frac{(f(x))^{n+1}}{n+1} + C, n \neq -1$

Ex1 (ii) $\int e^{f(x)} \cdot f'(x)dx = e^{f(x)} + C$

(iii) $\int \frac{1}{f(x)} \cdot f'(x)dx = \ln|f(x)| + C$

(d) Example 3 c): $\int \frac{2e^{5/x^4}}{3x^5}dx$

(ii)

c) $\int \frac{2e^{5/x^4}}{3x^5}dx = \int e^{\overbrace{\frac{5}{x^4}}^{=u}} \cdot \frac{2}{3x^5}dx$ $\quad \int \cdot u^n \sim dx$ or $\int e^f \sim du$ or $\int \frac{n}{f} \cdot dx$

$\boxed{u = \frac{5}{x^4} = 5 \cdot x^{-4}}$

diff

$\frac{du}{dx} = (-4) \cdot 5 \cdot x^{-4-1} = -20 \cdot x^{-5}$

$\boxed{du = -20 x^{-5} \cdot dx}$

$\frac{1}{-20}$ $\boxed{-\frac{1}{20}du = x^{-5}dx}$

$\frac{1}{x^5} \cdot dx.$

(5) 6.1 $= \frac{2}{3}\int e^{\frac{5}{x^4}} \cdot \underbrace{x^{-5}dx}_{-\frac{1}{20}du}$

$= \boxed{\frac{2}{3}\int e^u \left(-\frac{1}{20}\right) du}$

(5) 6.1 $= \frac{\cancel{2}}{3} \cdot \left(-\frac{1}{\cancel{20}_{10}}\right) \cdot \int e^u du = \left(-\frac{1}{30}\right) \int e^u du$

(3) 6.1 $= -\frac{1}{30}(e^u + C)$

$= \boxed{-\frac{1}{30}e^u + C}$

$= \boxed{-\frac{1}{30}e^{\frac{5}{x^4}} + C}$

(e) Example 3 d) $\int \frac{8t^3}{\sqrt[7]{2-5t^4}}dt = \int 8t^3 \cdot (\underbrace{2-5t^4}_{u})^{-\frac{1}{7}}dt$

t^3: numerator

diff $\boxed{u = 2 - 5t^4}$

$\frac{du}{dx} = -5 \cdot 4 t^3 = -20t^3$

$du = -20 \cdot t^3 \cdot dt$ $\quad \times \frac{1}{-20}$

$\boxed{-\frac{1}{20}du = t^3 dt}$

$= 8\int \underbrace{t^3}_{-\frac{1}{20}du}(\underbrace{2-5t^4}_{=u})^{-\frac{1}{7}}dt$

$= 8\int u^{-\frac{1}{7}} \cdot \left(-\frac{1}{20}\right)du$

$\boxed{= \frac{8}{-20} \cdot \int u^{-\frac{1}{7}}du}$

$=$

$$\int \frac{8t^3}{\sqrt[7]{2-5t^4}}\,dt \underset{(5)}{=} 8\int \frac{t^3}{\sqrt[7]{2-5t^4}}\,dt = 8\int \frac{-\frac{1}{20}}{u^{\frac{1}{7}}}\,du$$

$$\sqrt[7]{u}$$

6.1 = 4.2

$$\underset{(5)}{=} \boxed{-\frac{8}{20}\cdot\int \frac{1}{u^{\frac{1}{7}}}\,du} = -\frac{2}{5}\cdot\int u^{-\frac{1}{7}}\,du$$

6.1 4.5

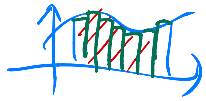
$$\underset{(1)}{=} -\frac{2}{5}\left(\frac{1}{-\frac{1}{7}+1}\cdot u^{-\frac{1}{7}+1} + C\right)$$

6.1

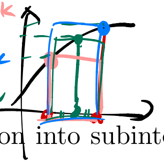
$$= -\frac{2}{5}\left(\frac{1}{\frac{6}{7}}\cdot u^{\frac{6}{7}} + C\right) = -\frac{2}{5}\cdot\frac{7}{6}\,u^{\frac{6}{7}} + C$$

$$= \boxed{-\frac{7}{15}\cdot u^{\frac{6}{7}} + C} = -\frac{7}{15}\cdot(2-5t^4)^{\frac{6}{7}} + C$$

(4) 6.3: Estimating Distance Traveled



Left sum → pink
Right sum → Blue
Midpoint sum → Green



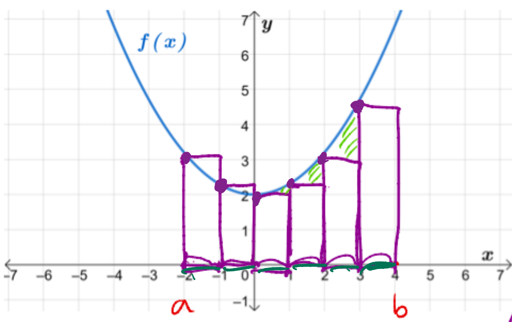
(a) We will estimate the area under a curve from $x = a$ to $x = b$ by dividing the region into subintervals (rectangles) of equal width.

$$\text{width of each subinterval } = \Delta x = \frac{b-a}{n}$$

where n is the number of subintervals (rectangles).

(b) (Left Sum) Example1: For the function $f(x) = 0.3x^2 + 2$, estimate the area of the region that lies under the graph of $f(x)$ between $\boxed{x = -2}$ to $\boxed{x = 4}$ using a left-hand sum with six subintervals of equal width.

Example 1: For the function $f(x) = 0.3x^2 + 2$, estimate the area of the region that lies under the graph of $f(x)$ between $x = -2$ to $x = 4$ using a left-hand sum with six subintervals of equal width.



$n = 6$

$b = 4$

$a = -2$

$$\boxed{\Delta x = \frac{4-(-2)}{6}} = \frac{6}{6} = 1$$

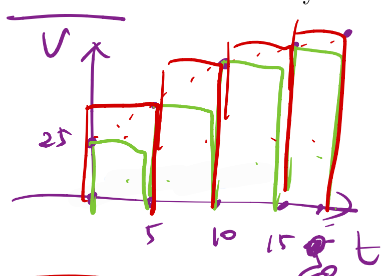
$$\boxed{L_n} = f(-2)\cdot 1 + f(-1)\cdot 1 + f(0)\cdot 1 + f(1)\cdot 1 + f(2)\cdot 1 + f(3)\cdot 1 = 17.7$$

Sum of all rectangulars

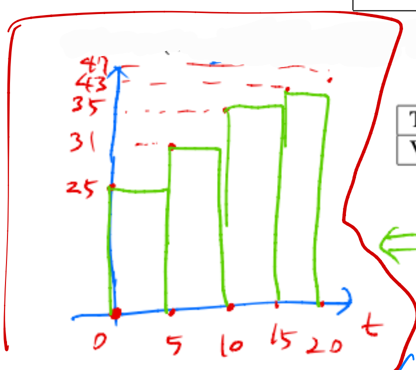
⇒ Underestimate

(c) Example 6: The table below shows the velocity (ft/s) of an object every five seconds over a 20 second time interval. Estimate the total distance the object travels over the 20 second time interval by finding upper and lower estimates (i.e., right and left sums).

Time (s)	0	5	10	15	20
Velocity (fts)	25	31	35	43	47



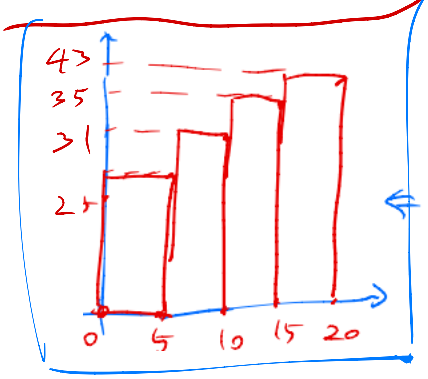
Time (s)	0	5	10	15	20
Velocity (ft/s)	25	31	35	43	47



Left sum $L_4 = V(0)\cdot 5 + V(5)\cdot 5 + V(10)\cdot 5 + V(15)\cdot 5$

$= 25\cdot 5 + 31\cdot 5 + 35\cdot 5 + 43\cdot 5$

$= \boxed{670 \text{ ft.}}$ Left sum: Lower sum



Right sum $R_4 = V(5)\cdot 5 + V(10)\cdot 5 + V(15)\cdot 5 + V(20)\cdot 5$

$= 31\cdot 5 + 35\cdot 5 + 43\cdot 5 + 47\cdot 5 = \boxed{780 \text{ ft}}$ Right sum Upper sum rightmost, left most us

(5) 6.4: ~~The Definite Integral~~

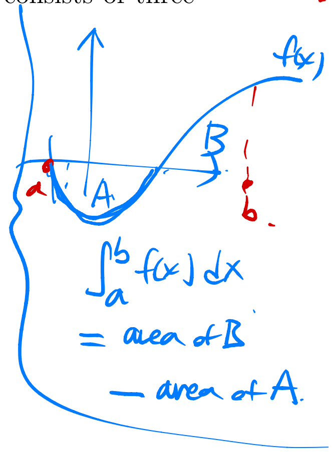
(a) In general, we can use any x-coordinate, x_i^*, to find the the height of the rectangle in the i^{th} subinterval. Using summation notation, we can write the sum of the areas of the rectangles as

$$f(x_1^*)\Delta x + f(x_2^*)\Delta x + \cdots + f(x_n^*)\Delta x = \sum_{i=1}^{n} f(x_i^*)\Delta x$$ = approximate area between f(x) and x-axis

The sum $\sum_i^n f(x_i^*)\Delta x$ is called a $\boxed{\text{Riemann sum}}$. area of rectangle

(b) Then, the ***definite integral*** of $f(x)$ from a to b is $\boxed{\int_a^b f(x)dx} = \boxed{\lim_{n\to\infty}\sum_{i=1}^{n} f(x_i^*)\Delta x}$

(c) Example 1: Use the graph of $f(x)$ below to find the following. Note that the graph consists of three straight lines and a semicircle.



$\int_a^b f(x)\,dx$ = area of B − area of A.

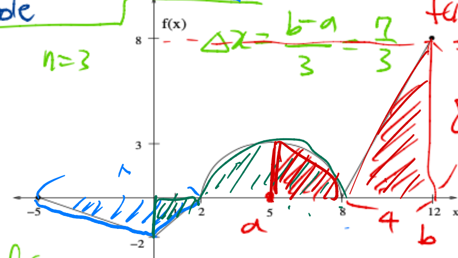
a) $\int_{-5}^{2} f(x)\,dx$

In $x \in (-5, 2)$, $f(x) < 0$

$= -(b-a)\cdot$ height of triangle $= -(2-(-5))\cdot \frac{2}{2} = -\frac{14}{2} = -7$

$f(x) = \begin{cases} -\frac{2}{5}x - 2 & -5 < x < 0 \\ x - 2 & 0 \le x < 2 \end{cases}$

$n = 3$



$\Delta x = \frac{b-a}{3} = \frac{7}{3}$

$f(-5+\frac{7}{3})\cdot\frac{7}{3} + f(-5+\frac{14}{3})\cdot\frac{7}{3}$

$\approx -14.$

b) $\int_0^8 f(x)\,dx$ = Area of Semicircle − Area of triangle

$= \pi\cdot 3^2\cdot\frac{1}{2} - 2\cdot 2\cdot\frac{1}{2}$

$= \frac{9}{2}\pi - 2$

c) $\int_5^{12} f(x)\,dx$ = Area of quarter of the circle + Area of triangle. $= \pi\cdot 3^2\cdot\frac{1}{4} + 4\cdot 8\cdot\frac{1}{2}$

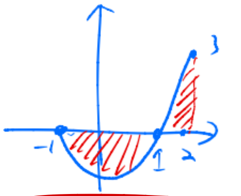
$= \frac{9}{4}\pi + 16$

(d) Example 3: Use a midpoint sum with $n = 3$ to estimate $\boxed{\int_{-1}^{2}(x^2-1)}dx$

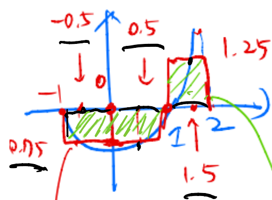
Example 3: Use a midpoint sum with $n = 3$ to estimate $\int_{-1}^{2}(x^2-1)\,dx$.

$b=2$
$a=-1$

$f(x)=x^2-1$
$f(-1)=(-1)^2-1=1-1=0$
$f(2)=2^2-1=3$
$f(0)=-1$



$$\boxed{\Delta x=\frac{2-(-1)}{3}=\frac{3}{3}=1}$$



$f(0.5)=f(-0.5)=0.25-1=-0.75$

$f(1.5)=2.25-1=1.25$

$\boxed{-2\times 0.75}+\boxed{1\cdot 1.25}=-1.5+1.25$
$=\boxed{-0.25\approx\int_{-1}^{2}(x^2-1)dx}$

(6) 6.5. The Fundamental Theorem of Calculus

(a) $\int_a^b f(x)dx$ gives an exact value and "counts" area above the x -axis positively and area below the x -axis negatively. from a to b

$\int_a^b f(x)dx=$ area of

(b) Properties of Definite Integral:

(i) $\int_a^b m\,dx = m(b-a)$, where m is a constant

(ii) $\int_a^a f(x)dx = 0$

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

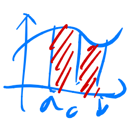
(iv) $\int_a^b kf(x)dx = k\int_a^b f(x)dx$, where k is a constant

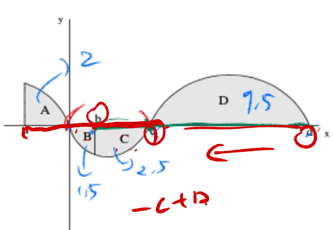
linearity

(v) $\int_a^b [f(x) \pm g(x)]dx = \int_a^b f(x)dx \pm \int_a^b g(x)dx$

(vi) $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$, where $a < c < b$

(c) Example 2: Use the graph of f (x) with the indicated areas below to answer the following.





area of A:	2.0
area of B:	1.5
area of C:	2.5
area of D:	9.5

area A $=\int_a^0 f(x)\,dx$
area B $=-\int_0^b f(x)\,dx$
area C $=-\int_b^c f(x)\,dx$
area D $=\int_c^d f(x)\,dx$

a) Find $\int_a^c f(x)\,dx - \int_0^c 2f(x)\,dx$ $=(4)$

$=\underbrace{\int_a^0 f(x)dx}_{\text{area } A}+\underbrace{\int_0^c f(x)dx}_{-(\text{area } B+C)}-\int_0^c 2f(x)dx$

$A-B-C$ $\quad 2\int_0^c f(x)dx$ $=-2(-B-C)$

$-2\cdot\int_0^c f(x)dx$

$-2\left(\underbrace{\int_0^b f(x)dx}_{-\text{area } B}+\underbrace{\int_b^c f(x)dx}_{-\text{area } C}\right)$

$= A-(B+C)-2(-B-C)$
$= A-\cancel{B}-\cancel{C}+\cancel{2}B+\cancel{2}C$
$= A+B+C \quad =2.0+1.5+2.5=6$

b) Find $\int_0^0 4f(x)\,dx + \int_d^b f(x)\,dx$ $=(6)$

$d>b$

$=-\int_b^d f(x)dx$
$=-\left(\int_b^c f(x)dx+\int_c^d f(x)dx\right)$
$=-(-C+D)$
$=C-D=2.5-9.5=-7$

(d) The Fundamental Theorem of Calculus, Part 2 - Suppose f is continuous on $[a, b]$

$$\boxed{\int_a^b f(x)dx = F(b) - F(a)}$$

where F is any antiderivative of f, that is, $F' = f$

(e) Example 5: Evaluate $\int_2^K (t^2 + 4)\, dt$

$\left[\frac{1}{3}t^3\right]_2^K$

$= \frac{1}{3}K^3 - \frac{1}{3}2^3$

Example 5: Evaluate $\int_2^K (t^2+4)\, dt$ $= \int_2^K t^2 dt + \int_2^K 4 dt$

$= \frac{1}{3}t^3 \Big|_2^K + \boxed{4\cdot(k-2)}$

FTC

$= \frac{1}{3}k^3 - \frac{1}{3}2^3 + 4k - 8$

$= \frac{1}{3}k^3 - \frac{8}{3} + 4k - 8 = \boxed{\frac{1}{3}k^3 + 4k - \frac{32}{3}}$

(f) Ex6:

Example 6: A honeybee population starts with 200 honeybees and increases at a rate of $n'(t) = 100e^{2t}$ bees per week, where t is in weeks and $t \geq 0$.

a) Find the change in the honeybee population over the first 4 weeks. Round to the nearest integer, if necessary

fnInt$(100e^{2x}, x, 0, 4)$ $\boxed{n(4) - n(0)} = \int_0^4 n'(t)\, dt = \boxed{\int_0^4 100\cdot e^{2t} dt}$

200

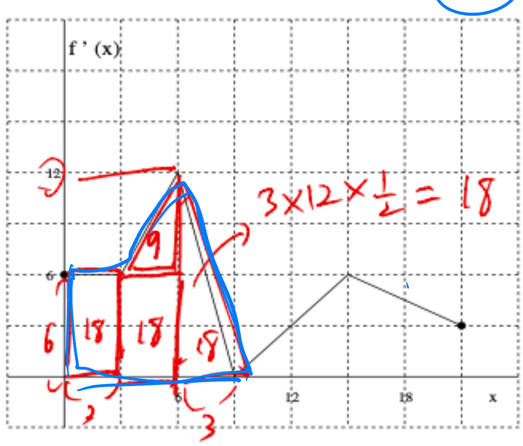
(1) Use calculator to calculate definite integral.

$= 148997.8994$

≈ 148998 bees

(g) Example 7: Consider the graph of $f'(x)$ shown below. If $f(0) = 50$, find $f(9)$.

Example 7: Consider the graph of $f'(x)$ shown below. If $f(0) = 50$, find $f(9)$.



$3 \times 12 \times \frac{1}{2} = 18$

$18 + 18 + 18 + 9 = 63$

$f(9) - f(0) = \int_0^9 f'(x)\, dx$

FTC

$50 \qquad = \qquad 63$

$f(9) - 50 = 63$

$f(9) = 113$

$f(9) - f(0)$

$= \int_0^9 f'(x) dx$

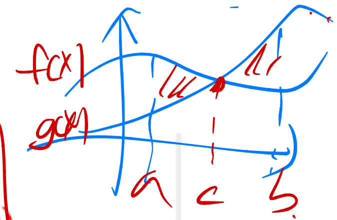
(h) Average Value of a Continuous Function f over $[a, b]$

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

(7) 6.6: Area Between Two Curves

(a) Theorem: If $f(x)$ and $g(x)$ are two continuous functions with $f(x) \geq g(x)$ on $[a, b]$, then the area between the two curves on $[a, b]$ is given by

$$\int_a^b (f(x) - g(x))dx.$$



Area $= \int_a^c f - g \, dx + \int_c^b g - f \, dx$

(b) Example 5: Find the area that is bounded by $y = -x^2$ and $y = 2x^3 - 5x$

① Find intersection pt.

② Draw your function with intersection

③ Determine which interval gives $f \geq g$ or $g \geq f$.

$f(x) = -x^2$

$g(x) = 2x^3 - 5x$

$-x^2 = 2x^3 - 5x$

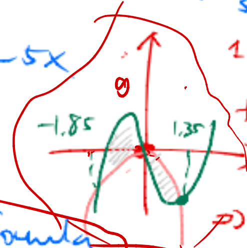
$\Rightarrow 0 = 2x^3 + x^2 - 5x$

$= x(2x^2 + x - 5)$

quadratic formula to figure out intersection

Calculator to figure out intersection

$x = 0, 1.3508, -1.8508$



$1 \in [0, 1.3508]$

$f(1) = -1$

$g(1) = 2 - 5 = -3$

$\Rightarrow \boxed{f \geq g}$ on $[0, 1.3508]$

$-1 \in [-1.8508, 0]$

$f(-1) = -1$

$g(-1) = -2 + 5 = 3$

$g \geq f$ on $[-1.8508, 0]$

③ $\int_{-1.8508}^{0} g(x) - f(x)\,dx = \int_{-1.8508}^{0} (2x^3 - 5x + x^2)\,dx$

$+ \int_0^{1.3508} f(x) - g(x)\,dx = \int_0^{1.3508} (-x^2 - 2x^3 + 5x)\,dx$

$\approx \boxed{6.8854}$

(c) Example 7: Set up the definite integral(s) representing the area bounded by $y = -x^2 + 10x - 17$ and the x-axis on $[5, B]$, where $B > 8$

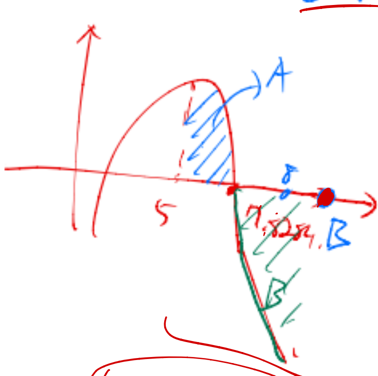
Example 7: Set up the definite integral(s) representing the area bounded by $y = -x^2 + 10x - 17$ and the x-axis on $[5, B]$, where $B > 8$.

$g(x) = 0 \quad f(x) = -x^2 + 10x - 17$

quadratic formula (calculator)

$x = \boxed{7.8284} < 8$

2.1716



$A = \int_5^{7.8284} f(x)\,dx = \int_5^{7.8284} (-x^2 + 10x - 17)\,dx$

$B = \int_{7.8284}^{B} -f(x)\,dx = \int_{7.8284}^{B} (+x^2 - 10x + 17)\,dx$

$\int_5^{7.82} f(x)\,dx - \int_{7.82}^{B} f(x)\,dx$

$= \left[\frac{1}{3}x^3 - 5x^2 + 17x\right]_{7.8284}^{B}$

$= \frac{1}{3}B^3 - 5B^2 + 17B - \left(\frac{1}{3}(7.82)^3 - 5(7.82)^2 + 17c\right)$

$=$