Mobius 8

4) $z-z_0 = \frac{df}{dx}(x-x_0) + \frac{df}{dy}(y-y_0) + \frac{df}{dz}(z-z_0)$

5) $z-z_0 = \frac{df}{dx}(x-x_0) + \frac{df}{dy}(y-y_0)$

$z_0 =$

6) $L(x,y,z) = f(x_0,y_0,z) + \frac{df}{dx}(x-x_0) + \frac{df}{dy}(y-y_0) + \frac{df}{dz}(z-z_0)$

7) $\left(\frac{dg}{ds}, \frac{dg}{dt}\right) \cdot \frac{v}{|v|}$

9)

$\frac{dT}{dt} = \frac{dT}{dx} \cdot \frac{dx}{dt} + \frac{dT}{dy} \cdot \frac{dy}{dt}$

10) $z = f(x,y)$ $x = g(t)$ $\frac{dx}{dt} = \frac{dg}{dt} = g'(3)$

$\frac{dz}{dt} = \frac{dz}{dx} \cdot \frac{dx}{dt} + \frac{dz}{dy} \frac{dy}{dt}$

12) $6xyz = 3x^2 + y^2 + 3z^2 + 5$

$\frac{dz}{dx}$? $\frac{dz}{dy}$?

$\frac{d}{dx}\underset{y,z\text{ const}}{(6xyz)} = \frac{d}{dx}(3x^2+y^2+3z^2+5)$

$6y \times z$

$6y(1)z + 6yx\frac{dz}{dx} = \ldots$

Mobius 7

2) $f(x) = \frac{27^n x^{3n}}{n}$

$f(x) = \underset{\text{const}}{\frac{27^n}{n}} \frac{d}{dx}(x^{3n})$

roc.

$\lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| = \ldots = \frac{27 \cdot x^2}{x^{-1}} < 1$

$27x^3 < 1$

$x^3 < \frac{1}{27}$

$x < \frac{1}{3}$

3) $\frac{x}{x^3}$ what's c in $c \cdot x^6$?

$\frac{a}{1-r}$ ☆ $|r|<1$

$\frac{x}{-3\left(1-\frac{x}{3}\right)} = \frac{\left(\frac{x}{-3}\right)}{1-\left(\frac{x}{3}\right)}$ $\left|\frac{1}{3}\right| < 1$ ✓

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

$-\frac{x}{3}\left(\frac{x}{3}\right)^5 = \frac{-x^6}{3 \cdot 3^5} = \frac{-1}{3^6} \cdot x^6$

4) $\ln(1+9x^2)$ radius of convergence?

$\ln(1+x) = \sum \frac{(-1)^n x^{n+1}}{n+1}$

$\ln(1+8x^3) = \sum \frac{(-1)^n (8x^3)^{n+1}}{n+1}$

5) $e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$

$e^{2x^2} = \sum \frac{(2x^2)^n}{n!}$

$(1+3x)e^{2x^2} = \sum (1+3x)\frac{(2x^2)^n}{n!}$

Mobius 4

1) $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{c}}$

3) Bacteria (Not half life)

$A = A_0 e^{kt}$

4) Find growth rate of population after 4 hours given

$P(t) = 1000e^{\frac{\ln 3}{3}t}$

$P'(4) = ?$

10) Find a, r, S of geometric series

$\sum_{1}^{\infty} \frac{2^{2n+1}}{(2^n)^3}$

$\cdots = 2^{1-n}$

form: $a_n = a_1 \cdot r^{n-1}$

$= 1 \cdot 2^{-(n-1)}$

$S = \frac{a}{1-r} = \frac{1}{1-\frac{1}{2}} = 2$

$= 1 \cdot (2^{-1})^{n-1}$

$a_1 = 1$ $r = \frac{1}{2}$

11) Sum of series: $36 + \frac{36}{7} + \frac{36}{49} \ldots$

$36\left(1 + \frac{1}{7} + \frac{1}{49} \ldots\right)$

$36\left(\frac{1}{1-\frac{1}{7}}\right) = 42$

12) geo series may be sum so seperate them. Identify it by sigma Σ sign.

Mobius 3

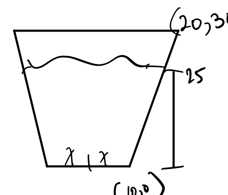
1) Avg value formula:

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

2) Arc Length:

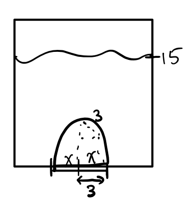
$$L = \int_a^b \sqrt{1+[f'(x)]^2}\,dx$$

3) What's hydrostatic Force?



$$F = \int_0^{25} 9800 \left(\overset{\text{length}}{\frac{y+30}{3}}\right)\left(\overset{\text{depth}}{25-y}\right) dy$$

4) What's F_H?



$x = \sqrt{9-y^2}$

$l = 2x = 2\left(\sqrt{9-y^2}\right)$

$$F_H = \int_0^3 9800 \left(\overset{\text{length}}{2\sqrt{9-y^2}}\right)\left(\overset{\text{depth}}{15-y}\right) dy$$

$n=0$
$n=1$ } will give
$n=2$ } coefficients

1. $\frac{1}{1-x} = \Sigma\ x^n$
2. $e^x = \Sigma \frac{x^n}{n!}$
3. $\sin x = \Sigma \frac{(-1)^n x^{2n+1}}{(2n+1)!}$
4. $\cos x = \Sigma \frac{(-1)^n x^{2n}}{(2n)!}$
5. $\ln(1+x) = \Sigma \frac{(-1)^n x^{n+1}}{n+1}$
6. Taylor series: $\sum_{n=0}^{\infty} \frac{f^{(n)}(a)(x-a)^n}{n!}$
7. Maclaurin Series: $f(a)+\sum_{n=1}^{\infty} \frac{(\text{Expand})\,x^n}{n!}$

Mobius 6

1) AST $\lim_{n\to\infty} a_n = 0$

$a_{n+1} \le a_n$

Ratio Test

2) $\lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| < 1$ conv.

3) Integral Test true.
$x \geq 1$ continuous, $f'(x) \leq 0$
Plug in $x=1$

7) $\Sigma \frac{1}{n^2+25} = \int \frac{1}{n^2+5^2}$ $\qquad \frac{1}{u}\arctan\left(\frac{x}{u}\right)$

$= \frac{1}{5}\arctan\left(\frac{n}{5}\right)$

8) Error Approximation for AST at most 10^{-2}.

$\Sigma \frac{(-1)^n}{n^2+27}$ $\qquad |b_{n+1}| < \frac{1}{100}$

$\frac{1}{(n+1)^2+27} < 100$

$n \approx 8$

13) $\sum_{0}^{\infty} \frac{(x-3)^n}{2^n\sqrt{n+1}}$ find interval of convergence.

Ratio Test. $|x-3| < 2$ $\qquad [1,5)$

Plug in $x = 1, 5$
use AST and p series $n \le 1$ div, then conv is [.

Mobius 5

2) Telescopic Sum
$\sum_{n=1}^{\infty} \frac{9}{n^2+5n+4}$

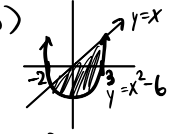
$\frac{A}{n+1} + \frac{B}{n+1} \Rightarrow \sum_{n=1}^{\infty}\left(\frac{-3}{n+4} + \frac{3}{n+1}\right)$

$\cancel{-\frac{3}{5}}$ $\boxed{+\frac{3}{5}}$
$\cancel{-\frac{3}{6}}$ $\boxed{+\frac{3}{3}}$
$\cancel{-\frac{3}{7}}$ $\boxed{+\frac{3}{4}}$
$\cancel{-\frac{3}{8}}$ $\cancel{+\frac{3}{5}}$

AST

7) $|S-S_n| = |b_{n+1}| < \frac{1}{100}$

5)



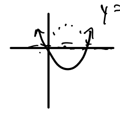
$M_x = \int_{-2}^{3} x(x-(x^2-6))$

$M_y = \int_{-2}^{3} \frac{1}{2}\{(x)^2-(x^2-6)^2\}$

$(\bar{x},\bar{y}) = \left(\frac{M_y}{A}, \frac{M_x}{A}\right)$

Mobius 2

1)



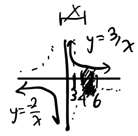
What's Volume?

$V = \int_a^b A(x)\,dx$

$V = \pi \int_a^b r_o^2 - r_i^2\,dx$

2) $x=4, 6$ $\qquad y=\frac{3}{x}$ $\qquad y=-\frac{2}{x}$

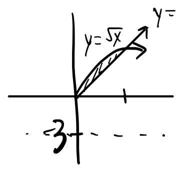
Find volume by cylinders.



$V = \int 2\pi r h\ dx$

$= 2\pi \int_4^6 (\ x-3\ )\left(\frac{3}{x} + \left(+\frac{2}{x}\right)\right) dx$

4)



find volume.

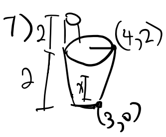
$\pi \int_a^b \left(\sqrt{x}+3\right)^2 - \left(\frac{1}{2}x+3\right)^2 dx$

5) Area Squares $= l^2$

6) Area SemiCircles $= \frac{\pi r^2}{2}$

$r = \frac{d}{2} = \frac{(2+e^x)}{2}$

7)

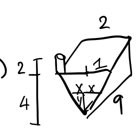


$P(x)$ weight? and $w(x)$?

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

$P(x) = \rho g A$
$P(x) = \int^2 9800\,(\pi r^2)$
$P(x) = \int_0^2 9800\pi \left(\frac{1}{2}y+3\right)^2 dy$
$w(x) = P(x)\,\text{dist}$
$= \int_0^2 P(x)\,(4-x)$

8)



What's work?

$W = Fd$

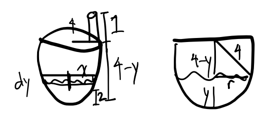
dist

$= \int_0^4 9800(2x\, dy \cdot 9)(6-y)$

$y = \frac{4}{1}x$

$x = \frac{y}{4}$

10)



$x^2+y^2=16$

$x = \sqrt{16-(4-y)^2}$

$W = \int$ density $\cdot$ dist $\cdot$ area dy

$= \int 9800\,(5-y)\,\pi\left(\sqrt{\ }\right)^2 dy$