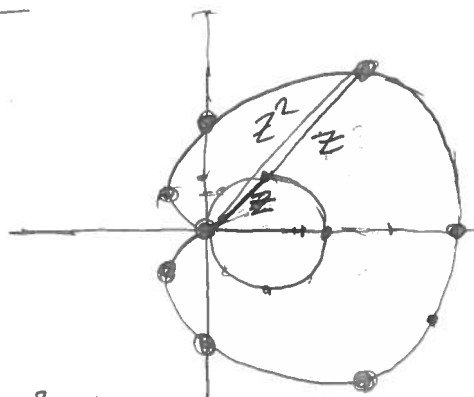
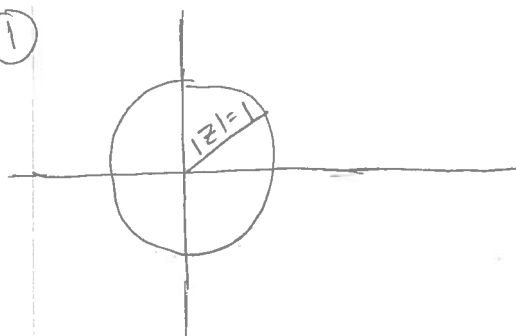


①

$$|z| = 1$$



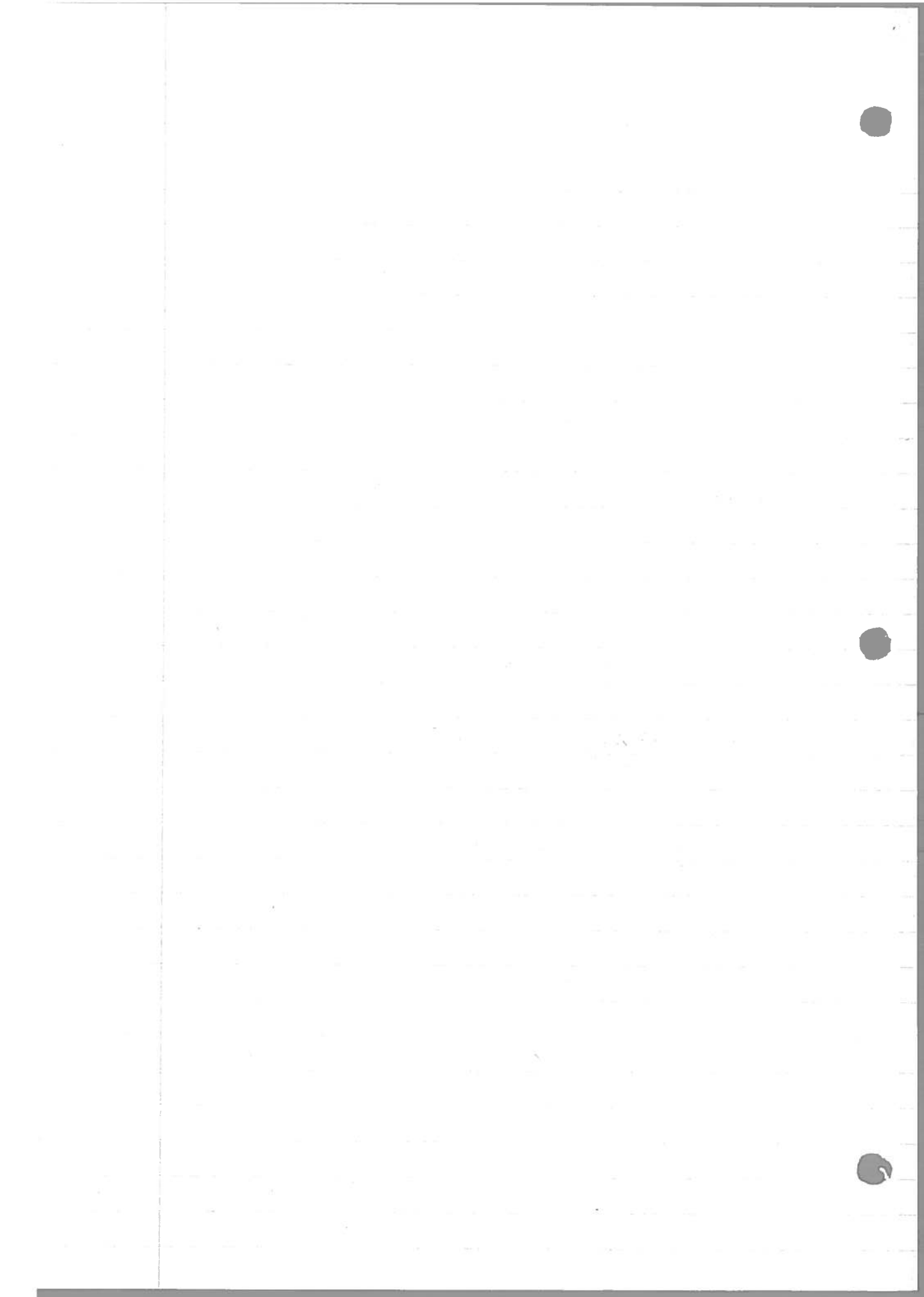
$$|z-1| = 1$$

~~z~~

$ z-1 $	$z \mapsto z^2$	
2	4	4
$1+i$	$1^2 + 2i - 1$	$2i$
0	0	0
$1-i$	$-2i$	

$$1 + e^{i\pi/4}$$

$$z \mapsto z^2$$



(10)

$$\frac{1}{1+x^2} = \sum_{j=0}^{\infty} \frac{\sin((j+1)\varnothing)}{\sqrt{1+k^2}^{j+1}} x^j$$

Recover $H(x) = \sum_{j=0}^{\infty} (-1)^j x^{2j}$

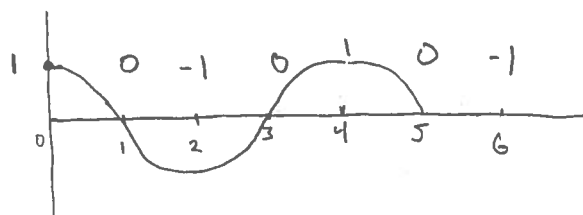
$$\cancel{x} = x - k$$

$$\varnothing = \arg(i - k)$$

$$k=0, \varnothing = \frac{\pi}{2}, \cancel{x} = x.$$

$$\frac{1}{1+x^2} = \sum_{j=0}^{\infty} \frac{\sin(\frac{\pi}{2}j + \frac{\pi}{2})}{1} x^j, \quad \sin(x + \frac{\pi}{2}) = \cos(x)$$

$$\frac{1}{1+x^2} = \sum_{j=0}^{\infty} \cos(\frac{\pi}{2}j) x^j$$



j	cos($\frac{\pi}{2}j$)
0	1
1	0
2	-1
3	0
4	1
5	0
6	-1

evens

$$= \sum_{j=0}^{\infty} \cos(\frac{\pi}{2}(2j)) x^{2j} + \sum_{j=0}^{\infty} \cos(\frac{\pi}{2}(2j+1)) x^{2j+1}$$

$$\frac{1}{1+x^2} = \sum_{j=0}^{\infty} \cos(\pi j) x^{2j} + 0$$

10

ii

$$\sum_{j=0}^{\infty} \frac{\sin((j+1)\phi)}{\sqrt{1+k^2}^{j+1}} \quad \text{X}$$

$$\begin{aligned} X &= x-k \\ \phi &= \arg(i-k) \end{aligned}$$

$$\sum_{j=0}^{\infty} \frac{\sin((j+1) \arg(i-k))}{\sqrt{1+k^2}^{j+1}} (x-k)$$

$$\tan(\arg(z)) = \frac{\operatorname{Im}(z)}{\operatorname{Re}(z)}$$

$$\sin((j+1) \arg(i-k)) = 0$$

$$\underbrace{\sin(j \arg(i-k))}_{\text{frequency modifier}} + \underbrace{\arg(i-k)}_{\text{offset}} = 0$$

$$X^2 \rightarrow \sin(3 \arg(i-k)) = 0$$

$$3 \arg(i-k) = 0, \pi, 2\pi, \dots$$

$$\arg(i-k) = 0, \frac{\pi}{3}, \frac{2\pi}{3}, \dots$$

$$\frac{i}{-k} = \tan(0), \tan\left(\frac{\pi}{3}\right), \tan\left(\frac{2\pi}{3}\right)$$

$$\frac{i}{-k} = 0, \sqrt{3}, -\sqrt{3}, 0, \sqrt{3}, -\sqrt{3}, \dots$$

$$k = \frac{-i}{\sqrt{3}}$$

$$k = \frac{i}{\sqrt{3}}$$

k is real

$$k = \pm \frac{1}{\sqrt{3}}$$

(15)

$$P(z) \quad Q(z)$$

$$R \text{ of } P(z)Q(z) > R \text{ of } P(z) \text{ and } R \text{ of } Q(z)$$

think in terms of $\frac{z^2}{(5-z)^3}$

R is distance to closest singularity

$$\frac{(1-z)}{(5-z)} \cdot \frac{(5-z)}{(1-z)(6-z)} = \frac{1}{(6-z)}$$

↓

$$R=5$$

↓

$$R=1$$

↓

$$R=6$$

(31)

$$\ln(1+x) = \int_0^x \frac{1}{1+x} dx$$

$$= \ln|1+x| \Big|_0^x$$

$$= \ln|1+x| - \ln|1|$$

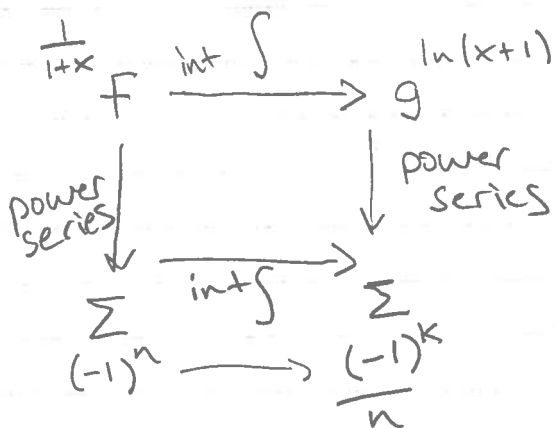
$$\ln(1+x) = \ln|1+x|$$

$$\frac{1}{1+x} = \frac{1}{1-(-x)} = \sum_{j=0}^{\infty} (-x)^j = 1 + (-x) + (-x)^2 + (-x)^3 + \dots$$

$$= 1 - x + x^2 - x^3 + x^4 + \dots$$

$$= x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$$

$$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$$



32

$$L(z) = \text{Log}(1+z)$$

Since $L(0) = 0$

$$L(z) = az + bz^2 + cz^3 + dz^4 + \dots$$

$$1+z = e^L = 1 + L + \frac{1}{2!}L^2 + \frac{1}{3!}L^3 + \dots$$

$$e^L = 1+z = 1 + L + \frac{1}{2!}L^2 + \frac{1}{3!}L^3 + \dots$$

$$1+z = 1 + (az + bz^2 + cz^3 + dz^4) + \frac{1}{2!}(az + bz^2 + cz^3 + dz^4)^2$$

$$e^L = 1+z = 1 + az + bz^2 + cz^3 + dz^4 + \frac{1}{2}(\boxed{a^2z^2} + abz^3 + acz^4 + adz^5 + abz^3 + b^2z^4 + bcz^5 + bdz^6 + acz^4 + bc^2z^5 + c^2z^6 + cdz^7 + adz^5 + bdz^6 + dcz^7 + d^2z^8)$$

$$1 = a + bz + cz^2 + \dots$$

$$a = 1$$

$$0 = bz^1 + c\cancel{z^2} + d\cancel{z^3} + \frac{1}{2}a^2z^1 + abz^2$$

$$0 = b + \frac{1}{2}$$

$$b = -\frac{1}{2}$$

Mathematica

$$c = \frac{1}{3}$$

$$d = -\frac{1}{4}$$

1. The first part of the document is a list of names and addresses.

2. The second part of the document is a list of names and addresses.

3. The third part of the document is a list of names and addresses.

4. The fourth part of the document is a list of names and addresses.

5. The fifth part of the document is a list of names and addresses.

6. The sixth part of the document is a list of names and addresses.

7. The seventh part of the document is a list of names and addresses.

8. The eighth part of the document is a list of names and addresses.

9. The ninth part of the document is a list of names and addresses.

10. The tenth part of the document is a list of names and addresses.

11. The eleventh part of the document is a list of names and addresses.

12. The twelfth part of the document is a list of names and addresses.

13. The thirteenth part of the document is a list of names and addresses.

14. The fourteenth part of the document is a list of names and addresses.

15. The fifteenth part of the document is a list of names and addresses.

16. The sixteenth part of the document is a list of names and addresses.

17. The seventeenth part of the document is a list of names and addresses.

18. The eighteenth part of the document is a list of names and addresses.

19. The nineteenth part of the document is a list of names and addresses.

20. The twentieth part of the document is a list of names and addresses.

21. The twenty-first part of the document is a list of names and addresses.

22. The twenty-second part of the document is a list of names and addresses.

23. The twenty-third part of the document is a list of names and addresses.

24. The twenty-fourth part of the document is a list of names and addresses.

25. The twenty-fifth part of the document is a list of names and addresses.

26. The twenty-sixth part of the document is a list of names and addresses.

27. The twenty-seventh part of the document is a list of names and addresses.

28. The twenty-eighth part of the document is a list of names and addresses.

29. The twenty-ninth part of the document is a list of names and addresses.

30. The thirtieth part of the document is a list of names and addresses.

$$e^{i\theta} = \cos \theta + i \sin \theta$$

$$(21) \quad z = r e^{i\theta}$$

$$e^z = \sum_{n=0}^{\infty} \frac{z^n}{n!} = 1 + z + \frac{z^2}{2!} + \frac{z^3}{3!} + \frac{z^4}{4!} + \dots$$

$$\begin{aligned} e^{r e^{i\theta}} &= \sum_{n=0}^{\infty} \frac{r^n e^{i n \theta}}{n!} \\ e^{r \cos \theta} e^{r i \sin \theta} &= \sum_{n=0}^{\infty} \frac{r^n}{n!} \cos(n\theta) + i \sin(n\theta) \end{aligned}$$

$$e^{r \cos \theta} \left[\cos(r \sin \theta) + i \sin(r \sin \theta) \right] = \sum_{n=0}^{\infty} \frac{r^n}{n!} \cos(n\theta) + i \sin(n\theta)$$

$$(1) \quad e^{r \cos \theta} \cos(r \sin \theta) = \sum_{n=0}^{\infty} \frac{r^n}{n!} \cos(n\theta)$$

$$(2) \quad e^{r \cos \theta} \sin(r \sin \theta) = \sum_{n=0}^{\infty} \frac{r^n}{n!} \sin(n\theta)$$

$$(i) \quad \cos(\sin \theta) e^{\cos \theta} = \sum_{n=0}^{\infty} \frac{\cos n\theta}{n!}$$

When $r=1$ in (1)

$$\sin(\sin \theta) e^{\cos \theta} = \sum_{n=0}^{\infty} \frac{\sin(n\theta)}{n!}$$

When $r=1$ in (2)

⑪ $\int_0^{2\pi} e^{\cos \theta} [\cos(\sin \theta)] \cos(m\theta) d\theta = \frac{\pi}{m!}, m = \text{int}$

$$e^{\cos \theta} \cos(r \sin \theta) \cos(m\theta) = \cos(m\theta) \sum_{n=0}^{\infty} \frac{r^n}{n!} \cos(n\theta)$$

$$\int_0^{2\pi} \cos(m\theta) \sum_{n=0}^{\infty} \frac{1}{n!} \cos(n\theta) d\theta = \frac{\pi}{m!}$$

$$\sum_{n=0}^{\infty} \int_0^{2\pi} \frac{1}{n!} \cos(m\theta) \cos(n\theta) d\theta = \frac{\pi}{m!}$$

$$r = \sqrt{2} x$$

$$(iii) \quad x = \frac{r}{\sqrt{2}} \quad f(x) = e^x \sin(x) =$$

$$f(x) = e^x \sin(x) \approx e^{r \cos(\theta)} \sin(r \cos(\theta))$$

$$\cos(\theta) = 1/\sqrt{2}$$

$$\theta = \pi/4$$

$$f(x) = e^{r \cos \theta} \sin(r \cos(\theta)) = \sum_{n=0}^{\infty} \frac{r^n}{n!} \sin(r \cos \theta)$$

$$e^{r \cos(\pi/4)} \sin(r \cos(\pi/4)) = \sum_{n=0}^{\infty} \frac{r^n}{n!} \sin(r \cos(\pi/4))$$

$$= \sum_{n=0}^{\infty} \frac{(\sqrt{2}x)^n}{n!} \sin(n \frac{\pi}{4})$$

$$= \sum_{n=0}^{\infty} \frac{\sqrt{2}^n x^n}{n!} \sin(n \frac{\pi}{4})$$

$$(iv) \quad f(x) = 0 + \sqrt{2} x \sin(\pi/4) + \frac{2 x^2 \sin(2 \pi/4)}{2!}$$

$$e^x \sin(x) = \left(1 + x + \frac{x^2}{2!} + \frac{x^3}{3!}\right) \left(x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!}\right)$$

This sound like a good thing to do
if I had more time ;)

(21)

$$\begin{aligned} a &= 1 \\ b &= 1 \\ t &= x \end{aligned}$$

(V)

$$\frac{d^n}{dt^n} [e^{at} \sin bt] = (a^2 + b^2)^{\frac{n}{2}} e^{at} \sin \left[bt + n \tan^{-1} \left(\frac{b}{a} \right) \right]$$

$$\frac{d^n}{dt^n} [e^x \sin x] = (2)^{\frac{n}{2}} e^x \sin \left[x + n \frac{\pi}{4} \right]$$

$$f(x) = e^x \sin x$$

$$f^n(0) = 2^{\frac{n}{2}} e^0 \sin \left[0 + n \frac{\pi}{4} \right]$$

$$f^n(0) = \sqrt{2}^n \sin \left[n \frac{\pi}{4} \right]$$

Taylor Series $f(x) = \sum_{n=0}^{\infty} \frac{f^n(a)}{n!} (x-a)^n, a=0$

$$f(x) = \sum_{n=0}^{\infty} \frac{f^n(0)}{n!} x^n$$

$$f(x) = \sum_{n=0}^{\infty} \frac{\sqrt{2}^n \sin \left[n \frac{\pi}{4} \right]}{n!} x^n$$

same as (iii)