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تحلیل

تجزیه و تحلیل سیستم ها و سیگنال ها

٪۱۰۰ ٪۹۰ ۵۷٪ ~~۳۸~~

٪۶۰ ← ۳۰٪

اهداف ←
- موفقیت در کنکور (درصد بالای ۶۰)
- درک مطلب درس
- آماده سازی برای آینده

روند برگزاری کلاس
- فیلم آنلاین ← درسنامه به همراه حل مثال و تست
- کلاس آنلاین ← حل تست ها و توضیح مجدد در صورت درخواست حل تست های بیشتر

دفع اشکال ←
- سایت
- ایلیمیشن
- کلاس آنلاین

منابع درسی ←
- جزوه کلاسی حضوری
- جزوه کلاس آنلاین
- منبع برای مطالعه صورت نیستند

درسی میدیم ← ~~درسی~~

* فقط تست

چیتا نیاز؟

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2 3

2+j 3+j → 3+2

در فضای مختلط کار می کنیم ←

دایره مثلثات:

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حقیقی و مختلط و موهومی چیست:

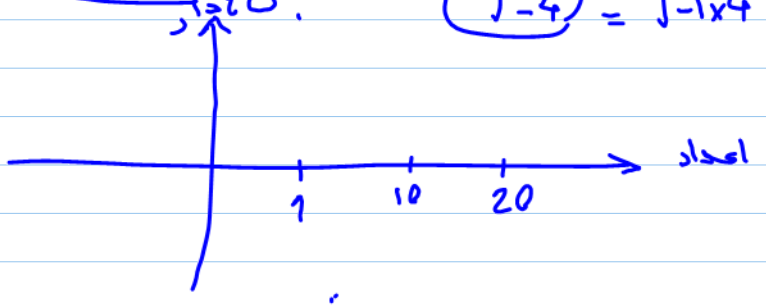
قرارداد

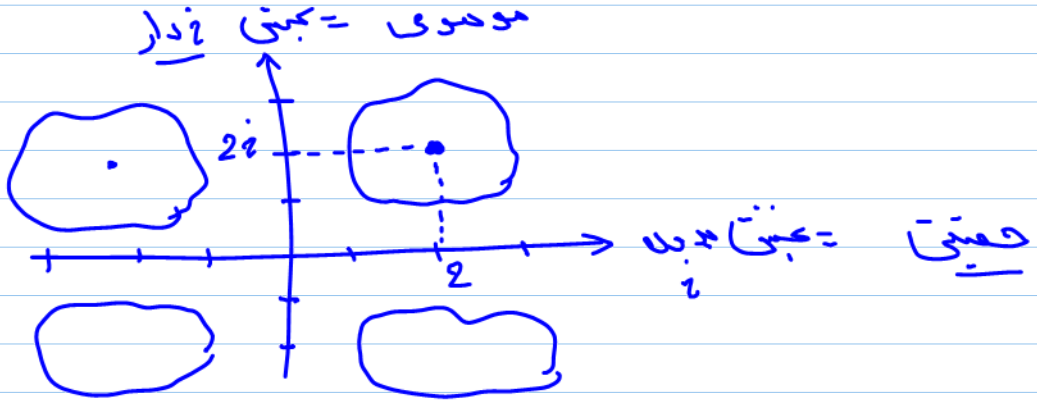
$\sqrt{-1} = i$ یا $j$ → $i^2 = -1$

$\sqrt{-4} = ?$

اعداد مختلط ←

$\sqrt{-4} = \sqrt{-1 \times 4} = \sqrt{-1} \times \sqrt{4} = i \times 2$



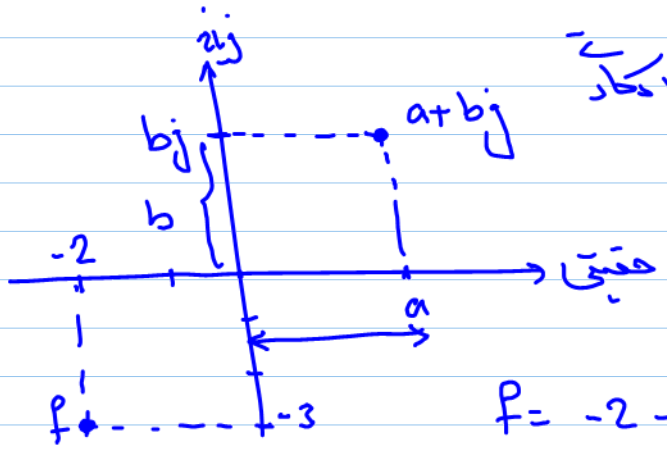

$3i = \sqrt{-9} = \sqrt{9} \times \sqrt{-1} = 3i$ 3 4 5

اعداد مختلط ← اعداد ترکیبی از حقیقی و موهومی

$g + bj = f$

$Re\{f\} = a$

$Im\{f\} = b$




مختصات مکان

$f = -2 - j3$

$Re\{f\} = -2$ $Im\{f\} = -3$

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$f = Re\{f\} + j\,Im\{f\}$ ← مختصات دکارتی

$-10 + j15 = x + -jy$ $\quad x, y = ?$

$x = -10 \qquad -y = 15 \rightarrow \begin{cases} x = -10 \\ y = -15 \end{cases}$

$(x+y) + j(x-y) = 5 + j(-1) = 5 - j$

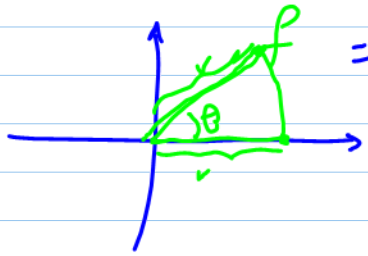
$$\begin{cases} x + y = 5 \\ x - y = -1 \end{cases} +$$

$2x = 4 \quad x = 2$

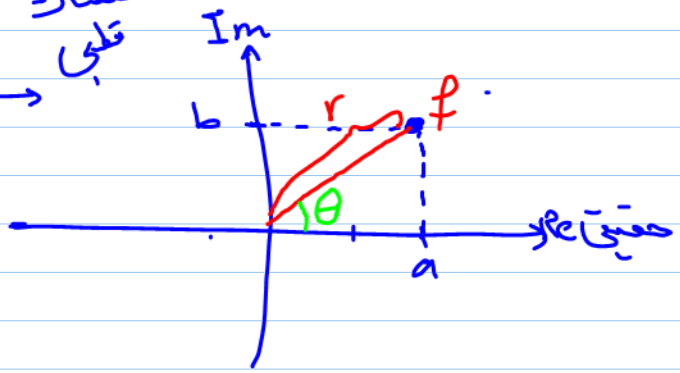
$2 - y = -1 \rightarrow 2 + 1 = y \quad y = 3$

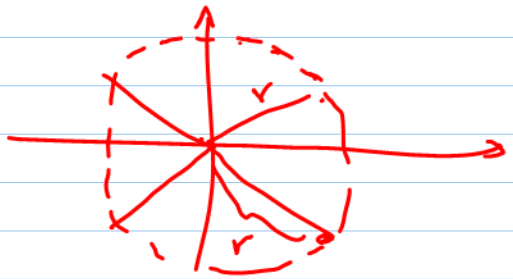
$f = a + bj$

$r$ بزرگی



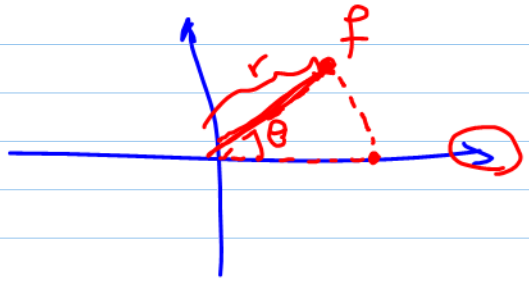

مختصات قطبی



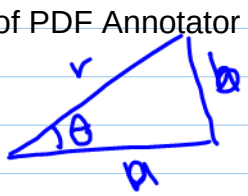



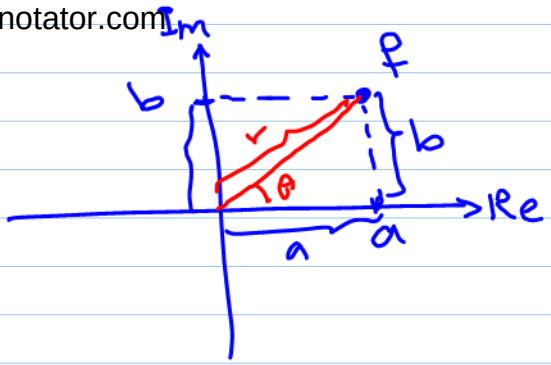

$f = Re\{f\} + j\,Im\{f\}$ = نمایی با شعاع $r$ و زاویه $\theta$ نسبت به محور حقیقی است

$\begin{cases} r = & f \text{ اندازه} \\ \theta = & f \text{ فاز} \end{cases}$



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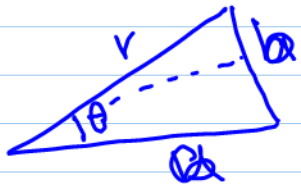



$$r = \sqrt{a^2 + b^2}$$

$$|f| = \sqrt{Re\{f\}^2 + Im\{f\}^2}$$

$$\sin\theta = \frac{b}{r} \qquad \cos\theta = \frac{a}{r}$$




$$\tan(\theta) = \frac{\sin\theta}{\cos\theta} = \frac{b}{a}$$

$$\tan\theta = \frac{b}{a} \qquad \theta = \tan^{-1}(b/a)$$

← θ ...

... ← b/a ... tan ... b/a ...

$$\theta = \tan^{-1}(1) = 45^\circ$$

$$f = a + bj \Rightarrow$$

$$f \rightarrow \begin{cases} \text{اندازه} = \sqrt{a^2+b^2} = \sqrt{Re(f)^2 + Im(f)^2} = |f| \\ \text{زاویه} = \tan^{-1}(b/a) = \tan^{-1}\left(\frac{Im(f)}{Re(f)}\right) = \angle f \end{cases}$$

$$f = |f| \angle f = |f| e^{j\angle f}$$

$$f = 2 e^{j20^\circ}$$

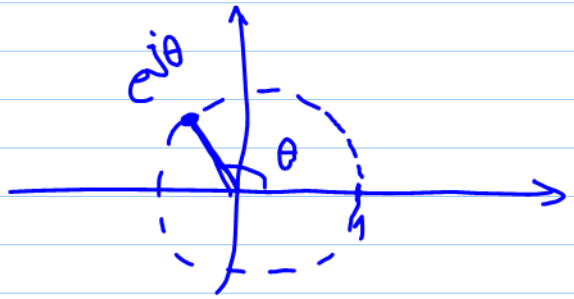
$$|f| = 2$$

$$\angle f = 20^\circ$$

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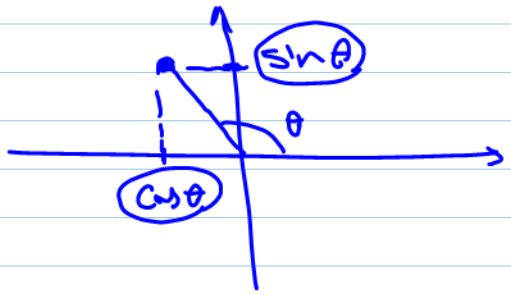
$e^{j\theta} = (1)\, e^{j\theta}$ = ضرب في 1

$$\boxed{|e^{j\theta}| = 1}$$




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

$$|e^{j\theta}| = \sqrt{\cos\theta^2 + \sin\theta^2} = \sqrt{1} = 1$$

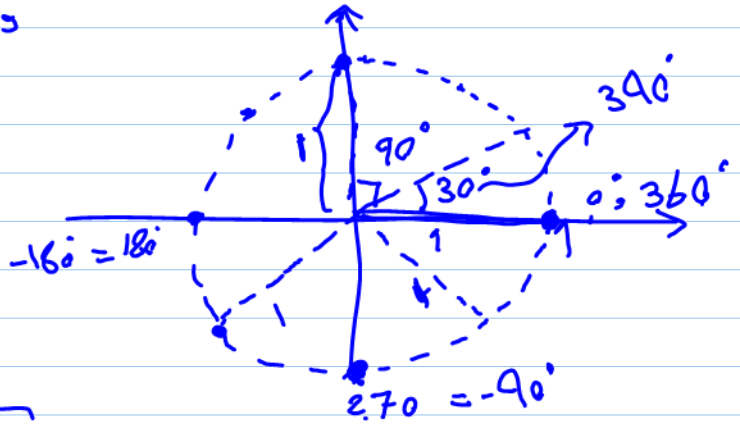



دائرة بنطاق = دائرة مثلثية
واحد

θ

360° = 0

390 = 30°

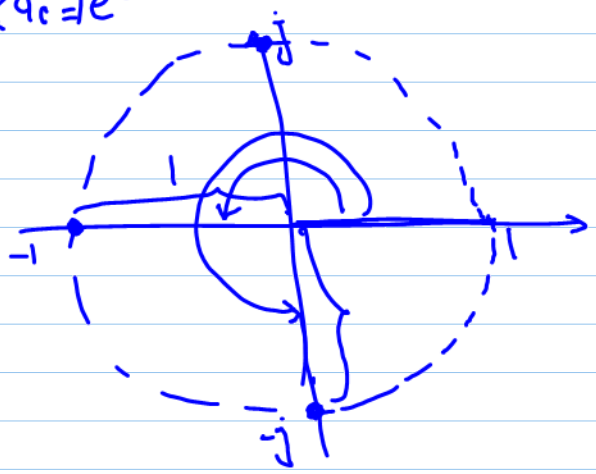



$f_1 = -j \Rightarrow \begin{cases} |f_1| = \sqrt{0^2 + 1^2} = 1 \\ \angle f = \tan^{-1}\left(\frac{1}{0}\right) = 90° \end{cases} = 1\angle 90° = 1e^{j90°}$

$1 \rightarrow = 1\, e^{j0}$

$-1 \rightarrow = 1\, e^{j180°}$

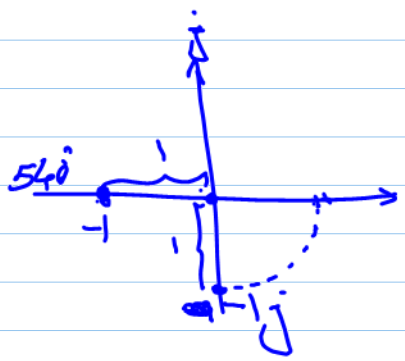
$-j \rightarrow = 1\, e^{j270°}$




$1e^{j(-90°)} = 0 + (-j) = -j$

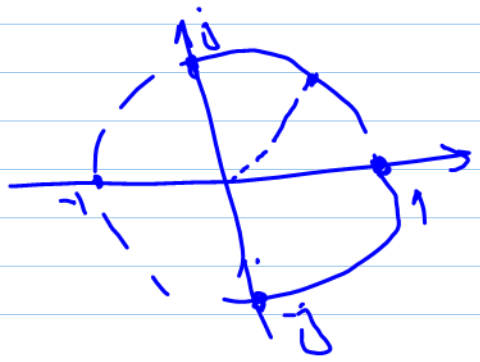
$2e^{j540°} = ?\ 2\left(1e^{j540°}\right)$

$= 2(-1) = \boxed{-2}$



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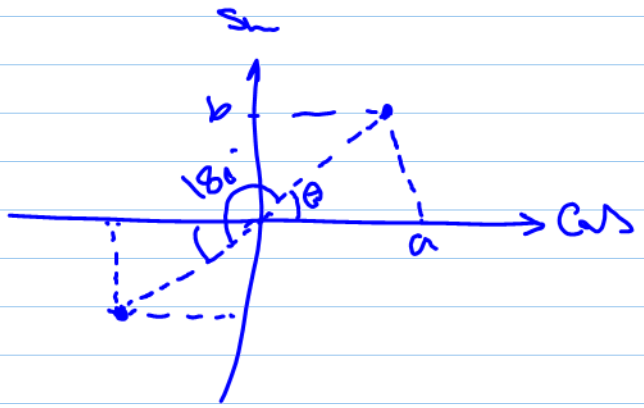
$r e^{j\theta} = r(\cos\theta + j\sin\theta)$




$\cos(\theta + \pi) = ?$

$\cos(\pi - \theta)$

$\sin(\frac{\pi}{2} - \theta) = \begin{cases} \sin\theta \\ \cos\theta \\ \vdots \end{cases}$




$180° = 1\pi$ رادیان

$90° = \pi/2$ $\quad 360° = 2\pi$

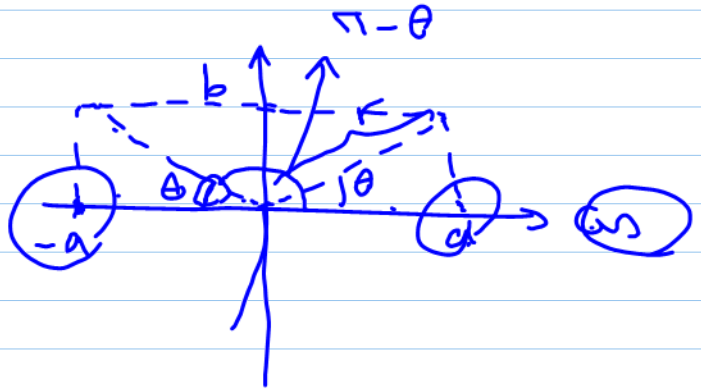
$-90° = -\pi/2$

رادیان و درجه

$\cos\theta = \frac{a}{r}$

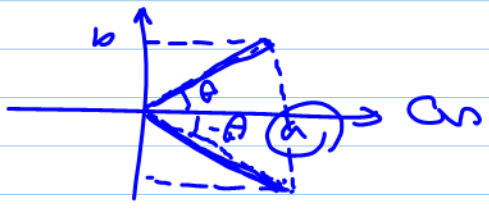
$\cos(\pi - \theta) = \frac{-a}{r}$

$= -\cos\theta$




$\cos\theta = \frac{a}{r}$

$\cos(-\theta) = \frac{a}{r} = \cos\theta$



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① $e^{j\theta} = \cos\theta + j\sin\theta$ تبدیل نمائی مطلب به دکارتی

② $\cos\theta = \dfrac{e^{j\theta} + e^{-j\theta}}{2}$ ,

③ $\sin\theta = \dfrac{e^{j\theta} - e^{-j\theta}}{2j}$

④ $e^{j(2k\pi)} = 1 \Rightarrow e^{j0}, e^{j2\pi}, e^{j4\pi}, e^{j(-2\pi)}$

$e^{j(2k\pi+\pi)} = e^{j(2k+1)\pi} = -1$

$e^{j\pi(k)} = (-1)^k = \begin{cases} 1 \\ -1 \end{cases}$ $k =$ زوج

$k =$ فرد

$e^{j\pi n} \leftrightarrow (-1)^n$ حوجا

$e^{j(2k\pi + \pi/2)} = j$

$e^{j(2k\pi + \frac{3\pi}{2})} = -j$

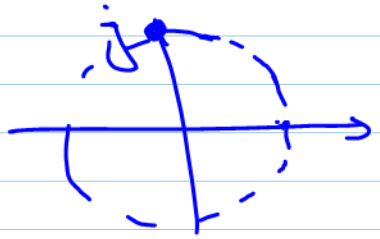
$e^{j\frac{5\pi}{2}} = ?$

$e^{j(2+0.5)\pi}$

$= e^{j(2\pi + \pi/2)} = j$

$1e^{j\frac{5\pi}{2}} = 1 \times j$

$2.5\pi = 2\pi + \pi/2$



⑤ $\sin x + \cos x = \sqrt{2}\cos(x - \pi/4)$

$\Rightarrow A\cos x + B\sin x = \sqrt{A^2+B^2}\cos(\theta - \tan^{-1}(B/A))$

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⑥ $\sin(x \mp y) = \sin x \cos y \mp \cos x \sin y$

$\cos(x \mp y) = \cos x \cos y \pm \sin x \sin y$

⑦ $\sin x \cos y = \frac{1}{2}(\sin(x+y) + \sin(x-y))$

⑧ $\cos x \cos y = \frac{1}{2}(\cos(x-y) + \cos(x+y))$

⑨ $\sin x \sin y = \frac{1}{2}(\cos(x-y) - \cos(x+y))$

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② ⑤ ← مزب

④ ⑧ ؟ مزب ؟ حتا

وقتا a مزب ط لت ؟ بوان نوتا:

$a = b \times$ (عدد صحيح) $\pm$

4 = ؟ x ( ) ؟ مزب 4 بت.

(4, 3) = 12 ← ك.م.م

4 : ±4 , ±8 , ±12 , ±16

3 : ±3 , ±6 , ±9 , ±12

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ک.م.م $\{4, 8\} = 8$

4 : 4 , 8

8 : 8 , 16

بعث انگلیسی