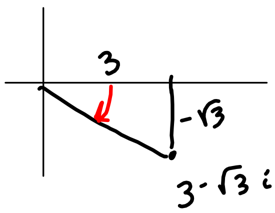
4.3 #8 3 - sqrt(3)*i*



$\arctan\left(-\frac{\sqrt{3}}{3}\right)$ in red

Write in trig form, with $0 \le \theta < 2\pi$

Using tangent:

$2\pi + \arctan\left(-\frac{\sqrt{3}}{3}\right)$ is the exact answer

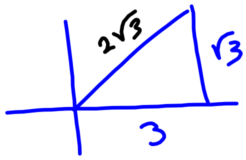
$\approx 2\pi - .5235987756$

≈ 5.759586532

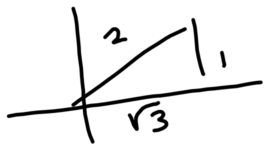
$|z| = \sqrt{3^2 + \sqrt{3}^2} = \sqrt{9+3} = \sqrt{12}$

$= 2\sqrt{3}$

```
tan⁻¹(-√(3)/3)
        -.5235987756
Ans+2π
         5.759586532
```

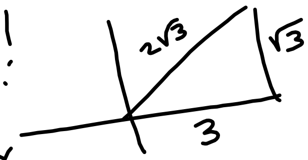


is similar to



TIMES $\sqrt{3}$:

DANG! IT WAS FRIENDLY!



Write the trigonometric form of the complex number. (Let $0 \leq \theta < 2\pi$.)

$$z = 2\sqrt{3}\left(\cos\left(2\pi + \arctan\left(-\frac{\sqrt{3}}{3}\right)\right) + i\sin\left(2\pi + \arctan\left(-\frac{\sqrt{3}}{3}\right)\right)\right)$$

Was accepted by the program. It turns out that the angle is just 330 degrees, i.e. $\frac{11\pi}{6}$!

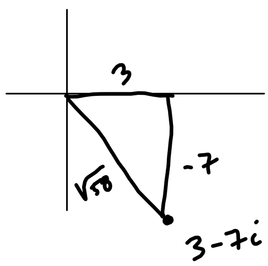
This would've been cleaner:

$2\sqrt{3}\left(\cos\left(\frac{11\pi}{6}\right) + i\sin\left(\frac{11\pi}{6}\right)\right)$!

My answer is exact, no matter WHAT the angle was.

Same question for a rando...

$2\,\underline{|\,58}$
$\quad 29$



$3-7i$

$\sqrt{3^2+7^2} = \sqrt{9+49} = \sqrt{58} = r$

$\sqrt{58}\left(\cos\left(2\pi + \arctan\left(-\frac{7}{3}\right)\right) + i\sin\left(2\pi + \arctan\left(-\frac{7}{3}\right)\right)\right)$

4.4 #7

$$\left(\cos\left(\frac{\pi}{3}\right) + i\sin\left(\frac{\pi}{3}\right)\right)^9 = \cos\left(\frac{9\pi}{3}\right) + i\sin(3\pi) = -1+0 = -1$$

$$z = r(\cos\theta + i\sin\theta) \Rightarrow$$

$$z^n = \left(r(\cos\theta + i\sin\theta)\right)^n = r^n\left(\cos(n\theta) + i\sin(n\theta)\right)$$

Multiplication rotates!

In #7, $r=1$, so we ignored it.

$$\sin^2\theta + \cos^2\theta = 1 \Rightarrow$$

$\cos\theta + i\sin\theta$ lies on the unit circle.

7. 0/1 points LarTrig10 4.5.023. [3883

Use DeMoivre's Theorem to find the indicated power of the complex number. Write the result in standard form.

$3(\sqrt{3} + i)^4$

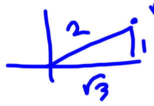
✖ $-24 + 24i\sqrt{3}$

① convert to trig
② calculate power
③ convert back to standard.

$z = 3(\sqrt{3} + i)^4$

Let $w = \sqrt{3} + i$
we take its 4^{th} power.

$\sqrt{3}+i$



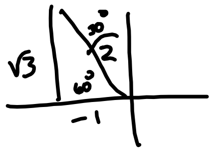
↪ $(\sqrt{3}, 1)$ in $\mathbb{R}^2$

$w = 2\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)$

$z = 3w^4 = 3\left(2^4\left(\cos\left(\frac{4\pi}{6}\right) + i\sin\left(\frac{2\pi}{3}\right)\right)\right)$

$= 48\left(\cos\left(\frac{2\pi}{3}\right) + i\sin\left(\frac{2\pi}{3}\right)\right)$

$= 48\left[-\frac{1}{2} + i\frac{\sqrt{3}}{2}\right] = \boxed{-24 + 24\sqrt{3}\,i}$



18. 0/4 points LarTrig10 4.4.053. [388

Consider the following.

$(6 + 6i)(1 - i)$ $= 6(1+i)(1-i) = 6(1^2+1^2) = 12$

(a) Write the trigonometric forms of the complex numbers. (Let $0 \le \theta < 2\pi$.)

$(6 + 6i) =$ ✗ $6\sqrt{2}\left(\cos\left(\frac{\pi}{4}\right) + i\sin\left(\frac{\pi}{4}\right)\right)$

$6+6i$ $\theta = \frac{\pi}{4}$

$|z| = \sqrt{6^2+6^2} = 6\sqrt{2}$

$(1 - i) =$ ✗ $\sqrt{2}\left(\cos\left(\frac{7\pi}{4}\right) + i\sin\left(\frac{7\pi}{4}\right)\right)$

$1-i$ $\theta = \frac{7\pi}{4}$ ($45°$ angle in QIV)

(b) Perform the indicated operation using the trigonometric forms. (Let $0 \le \theta < 2\pi$.)

✗ $12(\cos(0) + i\sin(0))$

$(6\sqrt{2})(\sqrt{2})\left(\cos\left(\frac{\pi}{4}+\frac{7\pi}{4}\right) + i\sin\left(\frac{8\pi}{4}\right)\right)$

$12(\cos(2\pi) + i\sin(2\pi)) = 12$

(c) Perform the indicated operation using the standard forms, and check your result with that of part (b).

✗ 12

12. 0/11 points LarTrig10 4.5.044. [388318

Consider the following.

Fifth roots of $32\left(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)$

$$\frac{\frac{3\pi}{4}}{5} = \frac{3\pi}{20}$$

(a) Use the formula $z_k = \sqrt[n]{r}\left(\cos\frac{\theta + 2\pi k}{n} + i\sin\frac{\theta + 2\pi k}{n}\right)$ to find the indicated roots of the complex number.

(Enter your answers in trigonometric form. Let $0 \le \theta < 2\pi$.)

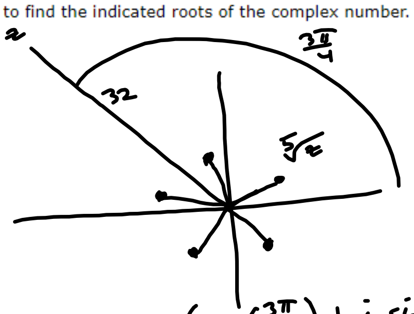
$z_0 =$ $2\left(\cos\frac{3\pi}{20} + i\sin\frac{3\pi}{20}\right)$

$z_1 =$ $2\left(\cos\frac{11\pi}{20} + i\sin\frac{11\pi}{20}\right)$

$z_2 =$ $2\left(\cos\frac{19\pi}{20} + i\sin\frac{19\pi}{20}\right)$

$z_3 =$ $2\left(\cos\frac{27\pi}{20} + i\sin\frac{27\pi}{20}\right)$

$z_4 =$ $2\left(\cos\frac{7\pi}{4} + i\sin\frac{7\pi}{4}\right)$



$$\sqrt[5]{z} = \sqrt[5]{32}\left(\cos\left(\frac{3\pi}{20}\right) + i\sin\left(\frac{3\pi}{20}\right)\right)$$

(b) Write each of the roots in standard form. (Round all numerical values to four decimal places.)

$z_0 =$ $1.7820 + 0.9080i$

$z_1 =$ $-0.3129 + 1.9754i$

$z_2 =$ $-1.9754 + 0.3129i$

$z_3 =$ $-0.908 - 1.782i$

$z_4 =$ $1.4142 - 1.4142i$

(c) Represent each of the roots graphically.

Increment: $\frac{2\pi}{5}$

$\sqrt[5]{32} = 2 = r$

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$\theta = \frac{3\pi}{4}$

$\frac{\theta}{5} = \frac{3\pi}{20}$

$k=0$: $\sqrt[5]{z} = 2\left(\cos\left(\frac{3\pi}{20}\right) + i\sin\left(\frac{3\pi}{20}\right)\right)$

1: $2\left(\cos\left(\frac{11\pi}{20}\right) + i\sin\left(\frac{11\pi}{20}\right)\right)$

2: $2\left(\cos\left(\frac{19\pi}{20}\right) + \cdots\right.$

3: $2\left(\cos\frac{27\pi}{20} + \cdots\right)$

4: $2\left(\cos\left(\frac{7\pi}{4}\right) + i\sin\left(\frac{7\pi}{4}\right)\right)$

$\frac{3\pi}{20} + \frac{2\pi}{5}\cdot\frac{4}{4} = \frac{3\pi + 8\pi}{20}$

$= \frac{11\pi}{20}$ $k=1$

$\frac{11\pi}{20} + \frac{8\pi}{20} = \frac{19\pi}{20}$ $k=2$

$\frac{27\pi}{20}$ $k=3$

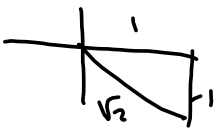
$\frac{7}{4}\pi = \frac{35}{20}\pi$ $k=4$

Part b: MAKE SURE YOU'RE IN RADIANS MODE!

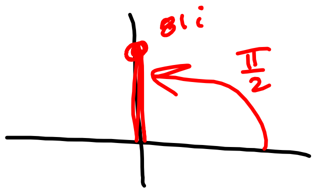
4: $2\left(\frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}}i\right) = 2\left(\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i\right)$

$= \sqrt{2} - \sqrt{2}\,i$

$\approx 1.4142 - 1.4142i$



#13 81i 's 4^{th} roots



$81i = \boxed{81\left(\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}\right)}$

$x^4 - 81i = 0$

$x^2 =$

can't easily factor to find them like you could for 4^{th} roots of 81:

$x^4 - 81 =$
$(x^2-9)(x^2+9)$
$(x-3)(x+3)(x-3i)(x+3i)$