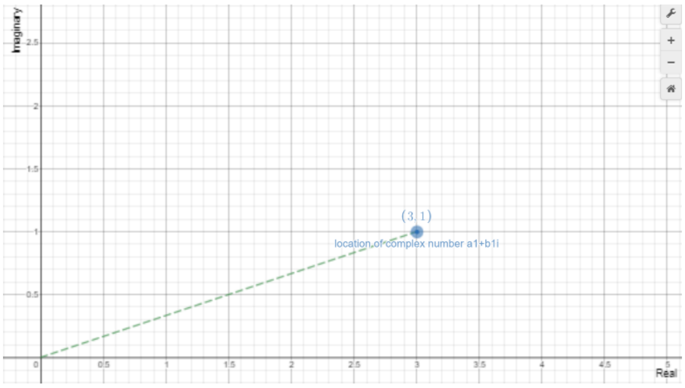
2020年 신호처리 과제 2 답안

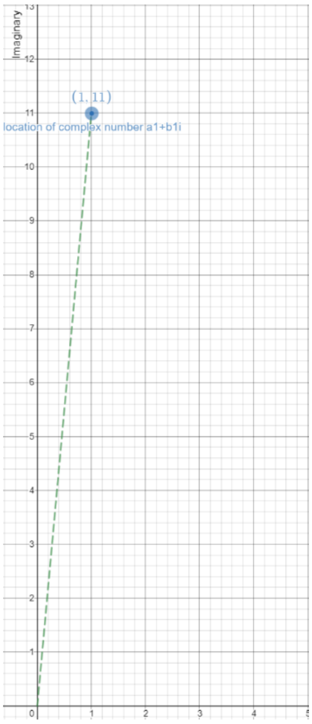
1. 다음을 복소수의 계산을 구하고, 좌표평면상에서 나타내시오.

$z_1 = 2 + i6$, $z_2 = 1 - i5$

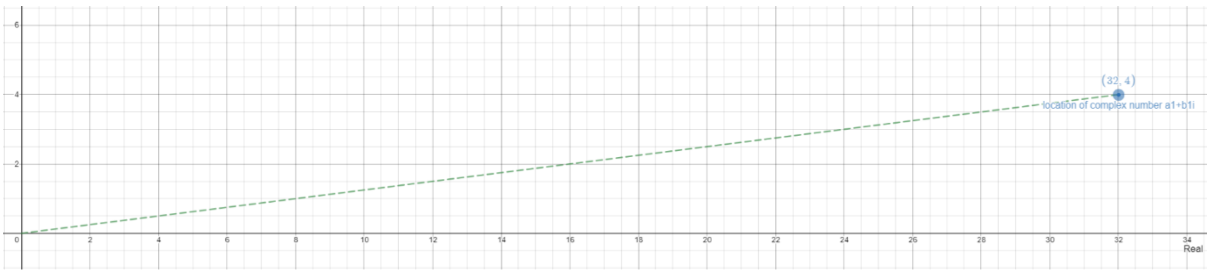
(1) $z_1 + z_2 = 3 + \mathrm{i}$



(2) $z_1 - z_2 = 1 + \mathrm{i}11$



(3) $z_1 * z_2 = 32 - 4\mathrm{i}$



2. 다음 오일러 공식을 복소수로 표현하시오..

(1) $e^{i\frac{\pi}{4}} = \cos\frac{\pi}{4} + i\sin\frac{\pi}{4} = \cos 45° + i\sin 45° = \frac{\sqrt{2}}{2} + i\,\frac{\sqrt{2}}{2}$

(2) $e^{i\pi} = \cos\pi + i\sin\pi = -1 + 0 = -1$

(3) $e^{i\frac{\pi}{2}} = \cos\frac{\pi}{2} + i\sin\frac{\pi}{2} = \cos 90° + i\sin 90° = 0 + i = i$

3. 다음 복소수를 크기와 각도를 구하여 극좌표 형식인 오일러 공식으로 나타내시오.

(1) $z = -2\sqrt{2} + i\,2\sqrt{2}$

$|z| = \sqrt{(-2\sqrt{2})^2 + (2\sqrt{2})^2} = 4$

$\theta = tan^{-1}\frac{2\sqrt{2}}{-2\sqrt{2}} = -45°$

$\therefore\ z = |4|\angle -45° = 4e^{i-\frac{\pi}{4}} = 4e^{i\frac{3}{4}\pi}$

(2) $z = 4\sqrt{3} - i\,4$

$|z| = \sqrt{(4\sqrt{3})^2 + (-4)^2} = 8$

$\theta = tan^{-1}\frac{-4}{4\sqrt{3}} = -30°$

$\therefore\ z = |8|\angle -30° = 8e^{i-\frac{\pi}{6}} = 8e^{i\frac{11}{6}\pi}$