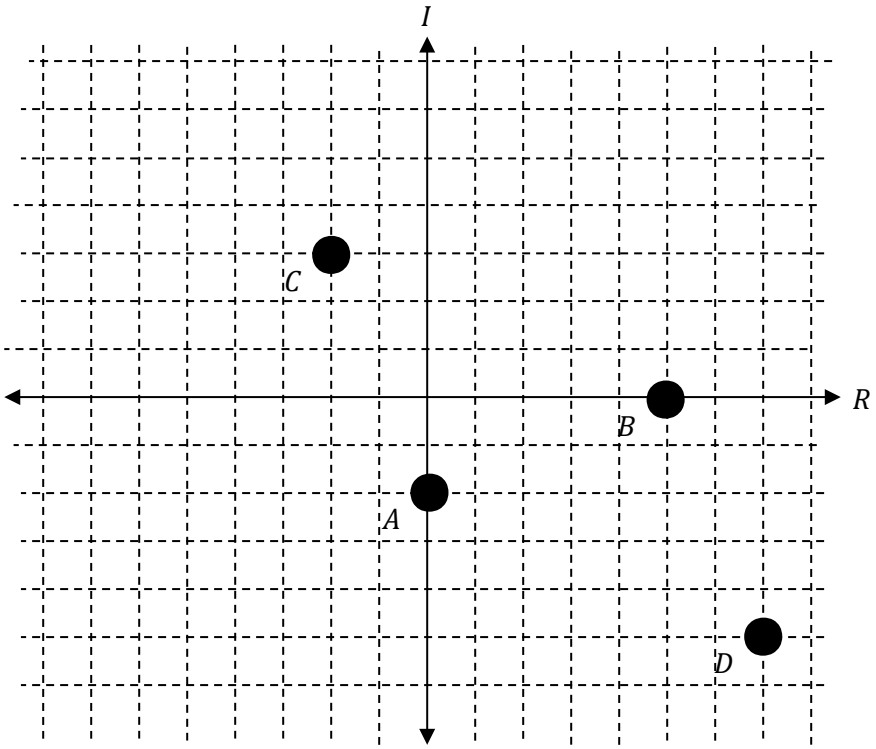
Complex Numbers Test A1 _____ **Name: SOLUTIONS**

Time: 30 Minutes **23** **Student Number:**_____

1) Plot and label the following set of complex numbers $A = -2j$, $B = 5$, $C = -2 + 3j$, and $D = 7 - 5j$.

[1 mark each]



2) Perform the indicated algebraic operation and simplify the result. State your answer in rectangular coordinates.

a) $(2 - 3j) + (-1 - 4j)$ **[2 marks]**

$= (2 - 1) + \big(-3 + (-4)\big)j$

$= 1 - 7j$

b) $(-4 + j) - (-3 + 2j)$ **[2 marks]**

$= (-4 + 3) + (1 - 2)j$

$= -1 - j$

c) $(-4 + j) \times (2 - 3j)$ **[3 marks]**

$= -8 + 12j + 2j - 3j^2$

$= -8 + 14j - 3(-1)$

$= -5 + 14j$

j) $(-3 + 5j) \div (2 + j)$ **[4 marks]**

$= \frac{-3+5j}{2+j} \times \frac{2-j}{2-j}$

$= \frac{-6+3j+10j-5j^2}{4-2j+2j-j^2}$

$= \frac{-6+13j+5}{4+1}$

$= -\frac{1}{5} + \frac{13}{5}j$

3) Convert each of the following complex numbers from rectangular form to polar form.

[2 marks each]

a) $-3-5j$

$r=\sqrt{(-3)^2+(-5)^2}$

$r=\sqrt{9+25}$

$r=\sqrt{34}$

$\theta_{ref}=\tan^{-1}\left(\frac{5}{3}\right)=59.04°$

$\theta=180°+59.04°=239.04°$

$-3-5j=\sqrt{34}\angle 239.04°$

b) $4-2j$

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

$r=\sqrt{16+4}$

$r=\sqrt{20}$

$r=2\sqrt{5}$

$\theta_{ref}=\tan^{-1}\left(\frac{2}{4}\right)=26.57°$

$\theta=360°-26.57°=333.43°$

$4-2j=2\sqrt{5}\angle 333.43°$

4) Convert each of the following complex numbers from exponential form into rectangular form.

[2 marks each]

a) $7e^{0.125j}$

$7e^{0.125j}=7(\cos(0.125)+j\sin(0.125))$

$=6.945+0.873j$

b) $8.2e^{8.230j}$

$8.2e^{8.230j}=8.2(\cos(8.230)+j\sin(8.230))$

$=-3.011+7.627j$