$|g(z)| = |ze^{-iz}| = |z||e^{-iz}|$
$= 2|e^{-iz}| = 2|e^{-i(x+iy)}|$
$= 2|e^{-ix}||e^{y}| = 2|e^{y}|$ on curved part of ∂B $= e^{y}$

$|e^{y}|$ max when $y = 2$

$\therefore |g(z)| \le 2|e^{2}| = 2e^{2}$

3A,M but $0+0i \in \partial B$ and $g(0) = 0$ good.

21/25 $\therefore 0 \le |g(z)| \le 2e^{2}$ which is of required form with $\alpha = 0, \beta = 2$

4) i) $\frac{d f(z)}{dz} = \frac{d}{dz}(\cosh(2e^{iz}))$

$= i \times 2e^{iz} \times \sinh(2e^{iz})$

a $= 2ie^{iz}\sinh(2e^{iz})$

exp and cosh are entire so they are differentiable on the whole of $\mathbb{C}$ and so must be differentiable at z, and $2e^{iz}$. It follows that the chain rule can be applied throughout the

2A domain of $f(z)$ and $f'(z)$ has the same domain as $f(z)$

ii) $\frac{d f(z)}{dz} = \frac{d}{dz}(z^{2}\mathrm{Log}\,z)$

$= 2z\mathrm{Log}\,z + z$

$\mathrm{Log}\,z$ is not continuous on the negative real axis, so is not differentiable there. However z^{2} is differentiable everywhere and $\mathrm{Log}\,z$ is differentiable on $\mathbb{C} - \{x : x \le 0\}$ so the domain of the derivative

2A is $\mathbb{C} - \{x : x \le 0\}$

b) i) Consider $\frac{df}{dz} = \lim_{h \to 0} \frac{f(z+h) - f(z)}{h}$ (Oi can't use $\frac{df}{dz}$ yet as we don't know if f is differentiable

at $z = 2 - 3i$

$\frac{df}{dz} = \lim_{h \to 0} \frac{f(2-3i+h) - f(2-3i)}{h}$

2A $= \frac{2+h+i-2-i}{h} = 1$

(PTO) Let $h = \varepsilon i$

1M $\frac{df}{dz} = \lim_{\varepsilon \to 0} \frac{f(2-3i+\varepsilon i) - f(2-3i)}{\varepsilon i}$