Complex Analysis: Day 23 **John Waczak**
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Residues

If $f(z)$ has a simple pole at a (a pole of multiplicity 1) then

$$Res_a(f) = \lim_{z \to a}(z-a)f(z)$$

More generally, suppose that $f(z)$ has a pole of multiplicity $m \geq 1$. Then

$$Res_a(f) = \lim_{z \to a}\left\{\frac{1}{(m-1)!}\left(\frac{d}{dz}\right)^{m-1}(z-a)^m f(z)\right\}$$