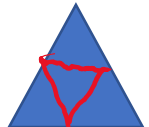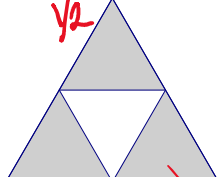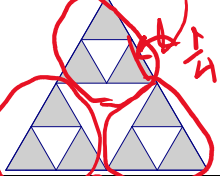Sierpinski triangle/gasket
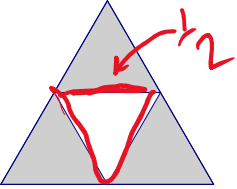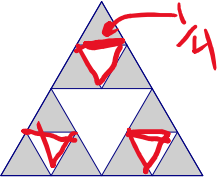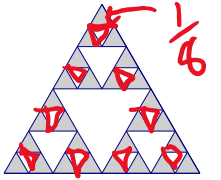rule: connect the midpoints and erase the middle

	Iteration number	How many triangles	Length of a side	Area of each triangle	How long are the lines (total length)?	How much area does it have?
(triangle)	0	1	1 u	1 T	3 u	1 T
(triangle)	1	3	$\frac{1}{2}$ u	$\frac{1}{4}$ T	$3 \cdot 3 \cdot \frac{1}{2}$ u	$\frac{3}{4}$ T
(triangle)	2	$3 \cdot 3 = 3^2$	$\left(\frac{1}{2}\right)^2$ u	$\frac{1}{4} \cdot \frac{1}{4}$ T $\left(\frac{1}{4}\right)^2$	$3^2 \cdot 3 \left(\frac{1}{2}\right)^2$ u	$\frac{3}{4} \cdot \frac{3}{4}$ T
(triangle)	3	$3 \cdot 9 = 27$ $= 3^3$	$\left(\frac{1}{2}\right)^3$ u	$\left(\frac{1}{4}\right)^3$ T	$3^3 \cdot 3 \left(\frac{1}{2}\right)^3$ u	$\left(\frac{3}{4}\right)^3$ T
	n	3^n	$\left(\frac{1}{2}\right)^n$ u	$\left(\frac{1}{4}\right)^n$ T	$\left(\frac{3}{2}\right)^n \cdot 3$ u	$\left(\frac{3}{4}\right)^n$ T
Limit	$n \to \infty$				∞	

$r > 1$
$$\lim_{n \to \infty} r^n = \infty$$

$r < 1$
$$\lim_{n \to \infty} r^n = 0$$

	iteration	New lengths	Total length
	0	$3 \quad u$	3
	1	$3 \cdot \frac{1}{2}$	$3 + 3 \cdot \frac{1}{2}$
	2	$3 \cdot 3 \cdot \left(\frac{1}{2}\right)^2$ 3Δ sides	$3 + 3 \cdot \frac{1}{2} + 3 \cdot 3 \cdot \left(\frac{1}{2}\right)^2$
	3	$3^2 \cdot 3 \left(\frac{1}{2}\right)^3$ Δs sides	$3 + 3 \cdot \frac{1}{2} + 3 \cdot 3 \left(\frac{1}{2}\right)^2 + 3^2 \cdot 3 \cdot \left(\frac{1}{2}\right)^3$
	n		$3 + \left(\frac{3}{2}\right) + \left(\frac{3}{2}\right)^2 + \left(\frac{3}{2}\right)^3 + \cdots \left(\frac{3}{2}\right)^n$ $\underbrace{\qquad}$ $a = \frac{3}{2} \qquad r = \frac{3}{2}$ $3 + -3 + \left(\frac{3}{2}\right)^n \cdot 3 = 3 \left(\frac{3}{2}\right)^n$
Limit			

Geometric series

$a =$ first term, common ratio r

has n terms

$$S = \frac{a - ar^n}{1-r} = \frac{\frac{3}{2} - \frac{3}{2}\left(\frac{3}{2}\right)^n}{1 - \frac{3}{2}}$$

$$= \frac{\frac{3}{2}\left(1 - \left(\frac{3}{2}\right)^n\right)}{-\frac{1}{2}}$$

$$= -2 \cdot \frac{3}{8} \left(1 - \left(\frac{3}{2}\right)^n \right)$$

$$= -3 + \left(\frac{3}{2}\right)^n \cdot 3$$