Algebra II
11-6
pg 533

1	48	9	$\frac{9}{2}(\sqrt{3}-1) \approx 3.294$
2	16	10	$\frac{2}{3}$
3	$\frac{81}{5} = 16.2$	11	4
4	81	12	$\frac{2}{3}$
5	no sum (∞)	23	$8 + \frac{8}{3} + \frac{8}{9} + \cdots$
6	2500	24	$40 + 32 + 25.6 + \cdots$
7	no sum (∞)	25	$40 - \frac{40}{3} + \frac{40}{9} - \cdots$
8	$\frac{3}{10}$	26	$75 + 30 + 12 + \cdots$

3) $27 - 18 + 12 - 8$

$$r = \frac{a_2}{a_1} = \frac{-18}{27} = -\frac{2}{3}$$

$$S_\infty = \frac{a_1}{1-r} = \frac{27}{\frac{3}{3}1 - (-\frac{2}{3})}$$

Get a common denominator.

$$= \frac{27}{\frac{5}{3}} = \frac{27}{1} \cdot \frac{3}{5} = \boxed{\frac{81}{5}}$$

9) $3\sqrt{3} - 3 + \sqrt{3} - 1$

$r = \frac{a_2}{a_1} = \frac{-3}{3\sqrt{3}} = -\frac{1\sqrt{3}}{\sqrt{3}\sqrt{3}} = -\frac{\sqrt{3}}{3}$

$S_\infty = \frac{a_1}{1-r} = \frac{3\sqrt{3}}{1-\left(-\frac{\sqrt{3}}{3}\right)} = \frac{3\sqrt{3}}{\frac{3}{3}+\frac{\sqrt{3}}{3}} = \frac{3\sqrt{3}}{\frac{3+\sqrt{3}}{3}} = \frac{3\sqrt{3}}{1} \cdot \frac{3}{3+\sqrt{3}} = \frac{(9\sqrt{3})(3-\sqrt{3})}{(3+\sqrt{3})(3-\sqrt{3})}$

$= \frac{9\sqrt{3}(3-\sqrt{3})}{9-3} = \frac{9(3\sqrt{3}-3)}{6} = \frac{27(\sqrt{3}-1)}{6} = \frac{9(\sqrt{3}-1)}{2}$

Alternate version (calculator)

9) $3\sqrt{3} - 3 + \sqrt{3} - 1 + \cdots$

$r = \frac{-3}{3\sqrt{3}} = \frac{-1}{\sqrt{3}}$

$S_\infty = \frac{a_1}{1-r} = \frac{3\sqrt{3}}{1-\left(-\frac{1}{\sqrt{3}}\right)} = 3\sqrt{(3)} \div (1 + 1 \div \sqrt{(3)})$

When you use a calculator, make sure you close the parentheses!

10) $4^{-\frac{1}{2}} + 4^{-\frac{3}{2}} + 4^{-\frac{5}{2}} + \cdots$

$r = \frac{a_2}{a_1} = \frac{4^{-\frac{3}{2}}}{4^{-\frac{1}{2}}} = \frac{4^{\frac{1}{2}}}{4^{\frac{3}{2}}} = 4^{-\frac{2}{2}} = 4^{-1} = \frac{1}{4}$

$S_\infty = \frac{4^{-\frac{1}{2}}}{1-\frac{1}{4}} = \frac{4^{-\frac{1}{2}}}{\frac{3}{4}} \xrightarrow{calc} \frac{\frac{1}{2}}{\frac{3}{4}} = \frac{1}{2} \cdot \frac{4}{3} = \boxed{\frac{2}{3}}$

At the time, I had not taught logarithms or fractional exponents, thus students needed to use the calculator to evaluate four to the negative half power.

12) $\sum_{n=1}^{\infty} \frac{2^n}{5^n} = \underset{a_1}{\frac{2^1}{5^1}} + \underset{a_2}{\frac{2^2}{5^2}} + \underset{a_3}{\frac{2^3}{5^3}} + \cdots$

$\frac{2}{5} + \frac{4}{25} + \frac{8}{125} + \cdots$

$r = \frac{2}{5}$

$S_\infty = \frac{a_1}{1-r} = \frac{\frac{2}{5}}{\frac{5}{5}-\frac{2}{5}} = \frac{\frac{2}{5}}{\frac{3}{5}} = \frac{2}{\cancel{5}} \cdot \frac{\cancel{5}}{3} = \boxed{\frac{2}{3}}$