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| **Literacy**method of differences, partial fractions. | **Research****Method of Differences Homework**Research the use of the method of differences for summing convergent infinite series. | **Memory**If $u\_{r}≡f\left(r+1\right)-f(r)$ then $$\sum\_{1}^{n}u\_{r}=f\left(n+1\right)-f(1)$$ |
| **Skills**1. By considering $f\left(r\right)-f(r+1)$ where $f\left(r\right)= \frac{r+2}{r(r+1)}$ or otherwise, find the sum of the following series

$$\sum\_{r=1}^{n}\frac{r+4}{r(r+1)(r+2)}$$1. Using the method of differences show that

$$\sum\_{r=1}^{n}\frac{2}{(r+1)(r+2)} = \frac{n}{n+2}$$1. Use the identity $\left(r+1\right)^{3}-r^{3}≡3r^{2}+3r+1 $to find $\sum\_{r=1}^{n}r(r+1)$
2. Find $\sum\_{r=1}^{n}(2r+1)$ using an appropriate function and the method of differences.
 | **Stretch**1. By considering the function $f\left(r\right)=r!$ Find the sum of the first $2n$ terms of the series

$$1×1!+2×2!+3×3!+4×4!+\cdots $$1. Let $f\left(r\right)=cos⁡(2rθ)$. Simplify $f\left(r\right)-f(r+1)$. Use your result to find the sum of the first $n$ terms of the series

$$\sin(\left(3θ\right)+\sin(\left(5θ\right))+\sin(\left(7θ\right))+\cdots )$$ |