Consider the sequence with $a_5 = 17$ and $a_{10} = 3$, and where each term is the previous term plus a fixed constant. **SCORE: _____ / 7 PTS**

[a] Find the general formula for this sequence.

$a_5 = a_1 + 4d = 17$

$a_{10} = a_1 + 9d = 3$

$\frac{1}{2}$ $\underline{5d = -14}$

$\frac{1}{2}$ $\underline{d = -\frac{14}{5}} = -2.8$

$a_1 + 4\left(-\frac{14}{5}\right) = 17$

$a_1 - \frac{56}{5} = 17$

1 $\underline{a_1 = \frac{141}{5}} = 28.2$

$\underline{a_n = \frac{141}{5} - \frac{14}{5}(n-1)}$ 2

OR

$a_n = 31 - \frac{14}{5}n \leftarrow$ OK

[b] Use the general formula to find the 21^{st} term of the sequence.

$a_{21} = 31 - \frac{14}{5}(21)$

$= \underline{-\frac{139}{5}} = -27.8$ 1

[c] Find the sum of the first 21 terms of the sequence. **<u>You must show the use of a series formula.</u>**

$S_{21} = \underbrace{\frac{21}{2}(28.2 - 27.8)}_{1} = \underbrace{4.2}_{1}$ OR $\frac{21}{5}$

Write the series $\frac{1}{4}-\frac{2}{8}+\frac{6}{16}-\frac{24}{32}+\frac{120}{64}-\frac{720}{128}$ in sigma notation. **SCORE: _____ / 4 PTS**

$$\left(\tfrac{1}{2}\right)\left[\overset{\left(\tfrac{1}{2}\right)}{\overset{6}{\underset{\underset{\left(\tfrac{1}{2}\right)}{n=1}}{\sum}}}\underbrace{(-1)^{n+1}}_{\left(\tfrac{1}{2}\right)}\frac{n!\ (1)}{2^{n+1}\ (1)}\right.$$

$$\text{OR } \sum_{n=0}^{5}(-1)^n\frac{(n+1)!}{2^{n+2}} \text{ OR } \sum_{n=2}^{7}(-1)^n\frac{(n-1)!}{2^n}$$

☆ SUBTRACT $\frac{1}{2}$ POINT IF THE INDEX UNDER Σ IS NOT THE VARIABLE IN THE FORMULA

Simplify the factorial expression $\frac{(3n)!}{(3n-2)!}$.

SCORE: _____ / 3 PTS

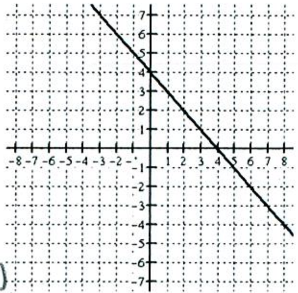
$$\frac{3n(3n-1)(3n-2)!}{(3n-2)!} = 3n(3n-1)$$

1 2

1 OK IF $\frac{3n(3n-1)(3n-2)\cdots(2)(1)}{(3n-2)\cdots(2)(1)}$ INSTEAD

Describe how the curves represented by the parametric equations $\begin{aligned} x &= \sin t \\ y &= 4 - \sin t \end{aligned}$ and $\begin{aligned} x &= e^t \\ y &= 4 - e^t \end{aligned}$ differ. **SCORE: _____ / 3 PTS**

<u>NOTE: Both sets of equations correspond to the rectangular equation *y* = 4 – *x* shown.</u>



(1) $-1 \leq \sin t \leq 1$, SO GRAPH OSCILLATES BETWEEN
$x=-1$ $(-1,5)$ AND $x=1$ $(1,3)$

(2) AS t GOES FROM $-\infty$ TO ∞,
$x=e^t$ GOES FROM ≈ 0 TO ∞,
SO GRAPH STARTS NEAR y-AXIS + GOES RIGHT/DOWN

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Find the sum $\sum_{n=3}^{6}(-1)^n(20-n^2)$. **<u>You must show the terms being added.</u>** **SCORE: _____ / 3 PTS**

$\underbrace{-11+4+5-16}_{2} = \underbrace{-18}_{1}$

Find the general formula for the sequence $64, \quad 96, \quad 144, \quad 216, \quad 324, \quad \cdots.$ SCORE: _____ / 3 PTS

$*\frac{3}{2} \quad *\frac{3}{2} \quad *\frac{3}{2} \quad *\frac{3}{2}$

$$a_n = \underbrace{64}_{1}\underbrace{\left(\frac{3}{2}\right)}_{1}^{\overbrace{n-1}^{1}}$$

Find parametric equations for the hyperbola with vertices $(\pm 3, 0)$ and foci $(\pm 7, 0)$. **SCORE: _____ / 4 PTS**

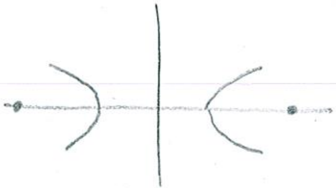
$c^2 = a^2 + b^2$

$49 = 9 + b^2$

$b^2 = 40$

$b = \underbrace{2\sqrt{10}}_{\frac{1}{2}}$

$$\frac{1}{2}\ \boxed{\begin{aligned} x &= \underbrace{3}^{\frac{1}{2}}\ \underbrace{\sec t}\ \ 1 \\ y &= \underbrace{2\sqrt{10}}_{\frac{1}{2}}\ \underbrace{\tan t}\ \ 1 \end{aligned}}$$



$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

Eliminate the parameter and write the rectangular equation for the curve represented by the parametric equations $\begin{array}{l} x = \ln 4t \\ y = 3t^2 \end{array}$. **<u>Write your final answer as y in terms of x.</u>**

SCORE: _____ / 3 PTS

$e^x = 4t \longrightarrow \underline{t = \frac{1}{4}e^x}$ $1\frac{1}{2}$

$y = 3\left(\frac{1}{4}e^x\right)^2$

$\underline{y = \frac{3}{16}e^{2x}}$ $1\frac{1}{2}$