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.

$$a_5 = a_1 + 4d = 17$$
$$a_{10} = a_1 + 9d = 3$$
$$\frac{1}{2} \quad 5d = -14$$
$$\frac{1}{2} \quad d = -\frac{14}{5} = -2.8$$

$$a_1 + 4\left(-\frac{14}{5}\right) = 17$$
$$a_1 - \frac{56}{5} = 17$$
$$1 \quad a_1 = \frac{141}{5} = 28.2$$

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

OR

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

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

$$a_{21} = 31 - \frac{14}{5}(21)$$
$$= -\frac{139}{5} = -27.8$$
$$1$$

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

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

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**

$$\left(\tfrac{1}{2}\right)\left[\sum_{n=1}^{6} (-1)^{n+1} \frac{n!}{2^{n+1}}\right. \quad \text{OR} \quad \sum_{n=0}^{5} (-1)^{n} \frac{(n+1)!}{2^{n+2}} \quad \text{OR} \quad \sum_{n=2}^{7} (-1)^{n} \frac{(n-1)!}{2^{n}}$$

(½) (½) (½) (1) (1)

☆ SUBTRACT ½ POINT IF THE INDEX UNDER Σ IS NOT THE VARIABLE IN THE FORMULA

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

SCORE: _____ / 3 PTS

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

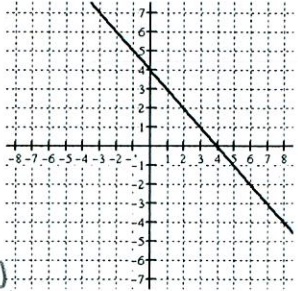
① ②

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 $\begin{array}{l} x = \sin t \\ y = 4 - \sin t \end{array}$ and $\begin{array}{l} x = e^t \\ y = 4 - e^t \end{array}$ 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**

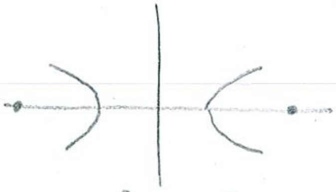
$* \frac{3}{2} \quad * \frac{3}{2} \quad * \frac{3}{2} \quad * \frac{3}{2}$

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

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 $\begin{array}{l} x = \ln 4t \\ y = 3t^2 \end{array}$. **Write your final answer as y in terms of x.**

SCORE: _____ / 3 PTS

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

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

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