Consider the sequence with $a_5 = 18$ and $a_{10} = 5$, and where each term is the previous term plus a fixed constant. **SCORE: ____ / 7 PTS**

[a] Find the general formula for this sequence.

$a_5 = a_1 + 4d = 18$

$a_{10} = a_1 + 9d = 5$

$\frac{1}{2}$ $5d = -13$

$\frac{1}{2}$ $d = \frac{-13}{5} = -2.6$

$a_1 + 4\left(\frac{-13}{5}\right) = 18$

$a_1 - \frac{52}{5} = 18$

(1) $a_1 = \frac{142}{5} = 28.4$

$a_n = \frac{142}{5} - \frac{13}{5}(n-1)$

OR (2)

$a_n = 31 - \frac{13}{5}n$ OK

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

$a_{21} = 31 - \frac{13}{5}(21)$

$= \frac{-118}{5} = -23.6$ (1)

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

$S_{21} = \frac{21}{2}(28.4 - 23.6) = 50.4$ OR $\frac{252}{5}$

(1) (1)

Write the series $\frac{1}{1} - \frac{2}{2} + \frac{6}{4} - \frac{24}{8} + \frac{120}{16} - \frac{720}{32}$ in sigma notation.

SCORE: _____ / 4 PTS

(½) $\sum_{n=1}^{6}$ (½) $(-1)^{n+1}$ (½) $\frac{n!}{2^{n-1}}$ (1)

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

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

Simplify the factorial expression $\dfrac{(5n)!}{(5n-2)!}$.

SCORE: _____ / 3 PTS

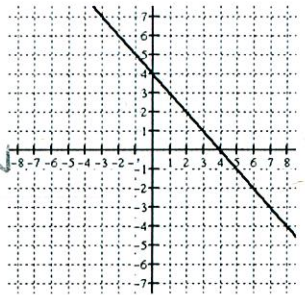
$\dfrac{5n(5n-1)(5n-2)!}{(5n-2)!} = 5n(5n-1)$ (2)

(1) ← OK IF WRITTEN $\dfrac{5n(5n-1)(5n-2)\cdots(2)(1)}{(5n-2)\cdots(2)(1)}$ INSTEAD

Describe how the curves represented by the parametric equations $x = e^t$, $y = 4 - e^t$ and $x = \cos t$, $y = 4 - \cos t$ differ.

SCORE: _____ / 3 PTS

NOTE: Both sets of equations correspond to the rectangular equation $y = 4 - x$ shown.



① 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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② $-1 \le \sin t \le 1$, SO GRAPH OSCILLATES BETWEEN $x = -1$ $(-1, 5)$ AND $x = 1$ $(1, 3)$

Find the sum $\sum_{n=3}^{6}(-1)^n(21-n^2)$. **You must show the terms being added.**

SCORE: _____ / 3 PTS

$-12+5+4-15 = -18$

(2) (1)

Find the general formula for the sequence $243, \quad 162, \quad 108, \quad 72, \quad 48, \quad \cdots$.

SCORE: _____ / 3 PTS

$a_n = 243\left(\frac{2}{3}\right)^{n-1}$ (1) (1) (1)

Find parametric equations for the hyperbola with vertices $(\pm 4, 0)$ and foci $(\pm 6, 0)$.

SCORE: _____ / 4 PTS

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

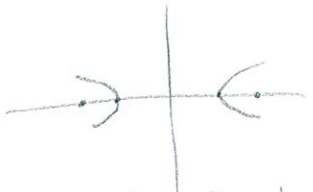
$36 = 16 + b^2$

$b^2 = 20$

$b = 2\sqrt{5}$ (½)

(½) $x = 4\sec t$ (½) (1)

$y = 2\sqrt{5}\tan t$ (½) (1)



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

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

SCORE: _____ / 3 PTS

$e^x = 3t \rightarrow t = \frac{1}{3}e^x$ (1 ½)

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

$y = \frac{4}{9}e^{2x}$ (1 ½)