① Find the first 5 terms of each sequence.

a) $a_n = -2a_{n-1} + 4$
$a_1 = -3$

b) $b_n = \dfrac{\pi^{n-1}}{2n}$

① a)

$a_1 = -3$

$a_2 = -2(-3) + 4 = 10$

$a_3 = -2(10) + 4 = -16$

$a_4 = -2(-16) + 4 = 36$

$a_5 = -2(36) + 4 = -68$

b)

$b_1 = \dfrac{\pi^0}{2(1)} = \dfrac{1}{2}$

$b_2 = \dfrac{\pi^1}{2(2)} = \dfrac{\pi}{4}$

$b_3 = \dfrac{\pi^2}{2(3)} = \dfrac{\pi^2}{6}$

$b_4 = \dfrac{\pi^3}{2(4)} = \dfrac{\pi^3}{8}$

$b_5 = \dfrac{\pi^4}{2(5)} = \dfrac{\pi^4}{10}$

② Given that the pattern continues, find the n^{th} term of the sequen (explicit form).

a) $1, -8, 27, -64, 125, \ldots$

b) $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \ldots$

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② a) $a_n = (-1)^{n-1} n^3$

b) $a_n = \frac{n}{n+1}$

③

a) Write out the sum.

$$\sum_{k=1}^{n} \frac{1}{e^{n+1}}$$

b) Express the sum using summatio notation.

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8} + \cdots + \frac{1}{100}$$

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③ a) $\frac{1}{e^2} + \frac{1}{e^3} + \frac{1}{e^4} + \cdots + \frac{1}{e^{n+1}}$

b) $\sum_{k=1}^{50} \frac{1}{2k}$

④ Find the sum.

a) $$\sum_{k=1}^{12} 6k^2 + k$$

b) $$\sum_{k=4}^{9} 2k^3$$

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④ a)

$$6\sum_{k=1}^{12} k^2 + \sum_{k=1}^{12} k$$

$$6\left[\frac{12(13)(2(12)+1)}{6}\right] + \frac{12(13)}{2}$$

$$3900 + 78$$

$$\boxed{3978}$$

b)

$$\sum_{k=1}^{9} 2k^3 - \sum_{k=}^{3}$$

$$2\sum_{k=1}^{9} k^3 - 2\sum_{k=1}^{3}$$

$$2\left[\frac{9(10)}{2}\right]^2 - 2\left[\frac{3(}{2}\right.$$

$$4050 - 72$$

$$\boxed{3978}$$

⑤ a) $a_1 = 2-7(1)$

$\boxed{a_1 = -5}$

$d = a_n - a_{n-1}$

$d = 2-7n-(2-7(n-1))$

$d = 2-7n-(2-7n+7)$

$d = 2-7n-(9-7n)$

$d = 2-\cancel{7n}-9\cancel{+7n}$

$\boxed{d=-7}$

b) $b_1 = 4^{3(1)}$

$\boxed{b_1 = 64}$

$r = \frac{a_n}{a_{n-1}}$

$r = \frac{4^{3n}}{4^{3(n-1)}} = \frac{4^{3n}}{4^{3n-3}}$

$r = 4^3$

$\boxed{r = 64}$

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⑤ a) Show that the sequence is arithmetic.

$a_n = 2-7n$

b) Show that the sequence is geometric

$b_n = 4^{3n}$

* Show means find the first term and prove co[illegible] differe[illegible]

⑥ The 12^{th} term of an arithmetic sequence is 91 and the 31^{st} term is 243

a) Find a recursive formula for the sequence.

b) Find an explicit formula for the sequence. (n^{th} term)

c) Find the 501^{st} term.

⑥

$a_{12} = d(12) + a_1 - d = 91$

$a_{31} = d(31) + a_1 - d = 243$

$11d + a_1 = 91$

$30d + a_1 = 243$

$\frac{19d}{19} = \frac{152}{19}$

$d = 8$

$11(8) + a_1 = 91$

$88 + a_1 = 91$

$a_1 = 3$

a) $\boxed{\begin{array}{l} a_1 = 3 \\ a_n = a_{n-1} + 8 \end{array}}$

b) $\boxed{a_n = 8n - 5}$

c) $a_{501} = 8(501) - 5$

$a_{501} = \boxed{4003}$

⑦ Find each sum.

a) $\sum_{n=1}^{17} (3n+4)$

b) $-5.5 + (-5) + (-4.5) + \ldots + 19.5$

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7 a) arithmetic $\Rightarrow S_n = \frac{n}{2}(a_1 + a_n)$

$S_{17} = \frac{17}{2}(7 + 55)$

$S_{17} = \boxed{527}$

b) arithmetic $\Rightarrow S_n = \frac{n}{2}(a_1 + a_n)$

need to find n first

$a_n = .5n - 6$

$19.5 = .5n - 6$

$25.5 = .5n$

$n = 51$

$S_{51} = \frac{51}{2}(-5.5 + 1$

$S_{51} = \boxed{357}$

⑧ The following is a geometric sequen

$$5, \frac{25}{2}, \frac{125}{4}, \frac{625}{8}, \ldots$$

a) Find a recursive formula for the sequ

b) Find an explicit formula for the sequ
(nth term)

c) Find the 8^{th} term.

⑧ a) $a_1 = 5$

$a_n = \frac{5}{2} a_{n-1}$

b) $a_n = 5\left(\frac{5}{2}\right)^{n-1}$

c) $a_8 = 5\left(\frac{5}{2}\right)^{8-1} = 5 \cdot \frac{5^7}{2^7} = \boxed{\frac{390625}{128}}$

⑨ Find each sum.

a) $\sum_{k=1}^{10} 7\left(\frac{1}{4}\right)^{k-1}$

b) [redacted] $8 + 16 + 32 + 64 + \ldots + 32{,}768$

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⑨ a) $S_n = a_1 \frac{1-r^n}{1-r}$

$S_{10} = 7 \cdot \frac{1-\left(\frac{1}{4}\right)^{10}}{1-\left(\frac{1}{4}\right)} = \frac{7\left(1-\frac{1}{1048576}\right)}{\frac{3}{4}} = \frac{7\left(\frac{10485}{10485}\right.}{\frac{3}{4}}$

$= \frac{\frac{7340025}{1048576}}{\frac{3}{4}} = \frac{\overset{2446675}{\cancel{7340025}}}{\underset{262144}{\cancel{1048576}}} \cdot \frac{4}{\cancel{3}} = \boxed{\frac{2446675}{262144}}$

b) $S_n = a_1 \frac{1-r^n}{1-r}$

$a_n = 8(2)^{n-1}$

$32768 = 8(2)^{(n-1)}$

$4096 = 2^{n-1}$

$\log_2 4096 = n-1$

$12 = n-1$

$13 = n$

$S_{13} = 8 \cdot \frac{1-}{1-}$

$= \boxed{6552}$

(10) Determine whether the sequence is arithmetic, geometric, or neither. If it is arithmetic, find the common differenc[e]. If it is geometric, find the common r[atio].

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

b) $b_n = -6n^3$

c) $c_n = 16 - n$

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(10) a) geometric $r = \frac{1}{2}$

$\frac{3}{2}, \frac{3}{4}, \frac{3}{8}, \frac{3}{16}, \ldots$

b) neither

c) arithmetic $d = -1$

$15, 14, 13, \ldots$

⑪ Determine whether each infinite geom
series converges or diverges. If it conve
find its sum.

a) $50 + 10 + 2 + \frac{2}{5} + \ldots$

b) $\frac{1}{7} + \frac{-1}{14} + \frac{1}{28} + \frac{-1}{56} + \ldots$

c) $\sum_{k=1}^{\infty} \left(\frac{5}{3}\right)^{k-1}$

⑪ a) $r = \frac{1}{5} \Rightarrow$ converges

$$S = \frac{a_1}{1-r} = \frac{50}{1-\frac{1}{5}} = \boxed{62.5}$$

b) $r = \frac{-1}{2} \Rightarrow$ converges

$$S = \frac{a_1}{1-r} = \frac{\frac{1}{7}}{1-\frac{-1}{2}} = \frac{\frac{1}{7}}{\frac{3}{2}} = \frac{1}{7} \cdot \frac{2}{3} = \boxed{\frac{2}{21}}$$

c) $r = \frac{5}{3} \Rightarrow$ diverges