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

$$a_n = a_1 + (n-1)d$$

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

$$a_n = a_1 r^{n-1}$$

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

$$S_\infty = \frac{a_1}{1-r}$$

$$(a+b)^n = \sum_{k=0}^{n} \binom{n}{k} a^{n-k} b^k$$

$$\binom{n}{k} = \frac{n!}{k!\,(n-k)!}$$

$$P(t) = P_0 e^{kt}$$

1. Find the indicated term of the sequence.

$a_n = \left(1 + \frac{1}{n}\right)^2$; a_{80} $= \left(1+\frac{1}{80}\right)^2 = \left(\frac{80+1}{80}\right)^2 = \frac{81^2}{80^2} = \boxed{\frac{6561}{6400}}$

≈ 1.025

2. Predict the nth term of the sequence.

$\frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}, \ldots$

$n=1$ $\frac{n}{2}, \frac{n}{3}, \frac{n}{4}, \frac{n}{5}$

$\boxed{\frac{n+1}{n+2}}$

3. Find and evaluate the sum.

$\sum_{k=1}^{8} (-1)^{k+1} 3k = (-1)^{1+1} \cdot 3(1) + (-3)(2) + 3(3) - 3(4) + 3(5) - 3(6) + 3(7) - 3(8) = \boxed{-12}$

4. Write sigma notation for the series.

$4 - 9 + 16 - 25 + \cdots + (-1)^n n^2$

$\sum_{i=2}^{n} (-1)^i i^2$

$\sum_{i=1}^{n} (-1)^{i+1} (i+1)^2$

5. Write the 4th term of $(2x+y)^5$.

$a = 2x$
$b = y$
$n = 5$
$k = 3$

$\binom{5}{3}(2x)^{5-3}(y)^3$

$\frac{5!}{3!\,(5-3)!}(2x)^2 y^3 = \frac{5!}{3!\,2!}(4x^2y^3)$

$= \frac{5 \cdot \cancel{4}^{2} \cdot \cancel{3!}}{\cancel{3!} \cdot \cancel{2}}(4x^2y^3) = \boxed{40x^2y^3}$

Given the polynomial $f(x) = -\frac{1}{3}\left(x+\frac{3}{2}\right)^2 (x-1)^3(x-2)^4$, $= -\frac{1}{3}\left(x+\frac{3}{2}\right)^2(x-1)^3(x-2)^4$

a. (5 points) Find the real **zeros** and state the **multiplicity** of each.

$-3/2$ 1 2

2 even 3 odd 4 even

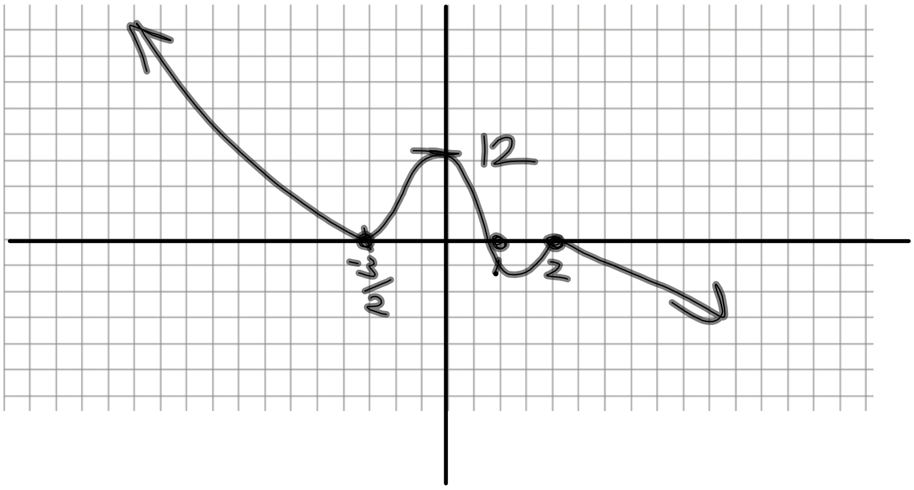
b. (5 points) State the **lead term** and make a sketch depicting the end behavior of the graph.

$-\frac{1}{3}x^9$

c. (3 points) State the y-intercept as an **ordered pair**.

$-\frac{1}{3}\left(\frac{3}{2}\right)^2(-1)^3(-2)^4 = \frac{1}{\cancel{3}}\cdot\frac{3^{\cancel{2}}}{\cancel{2^2}}\cdot\frac{2^{\cancel{4}\,2}}{1} = 12$ $(0,12)$

d. (6 points) Graph the polynomial. **Label** x- and y-intercepts.



Find a formula for the inverse of the one-to-one function.

$$f(x) = \frac{x-1}{x+7}$$

$(f \circ f^{-1})(x) = ?$

$x = \frac{y-1}{y+7}$

$x(y+7) = y-1$

$xy + 7x = y - 1$

$xy - y = -1 - 7x$

$y(x-1) = -1-7x$

$y = \frac{-1-7x}{x-1}$

$$\boxed{f^{-1}(x) = \frac{1+7x}{1-x}}$$

f & g are inverses if

$(f \circ g)(x) = x$ &

$(g \circ f)(x) = x$

$$\frac{\frac{1+7x}{1-x}-1}{\frac{1+7x}{1-x}+7} = \frac{\frac{1+7x-(1-x)}{1-x}}{\frac{1+7x+7(1-x)}{1-x}}$$

$$= \frac{1+7x-1+x}{\cancel{1-x}} \cdot \frac{\cancel{1-x}}{1+7x+7-7x}$$

$$= \frac{\cancel{8}x}{\cancel{8}} = x$$