$f(0) = 1$
$f'(0) = 5$
$f''(0) = 25$

Center $x = 0$

Construct the first 3 nonzero terms and the general term of the Maclaurin Series generated by the function and give the interval of convergence.

$f(x) = e^{5x}$
$f'(x) = 5e^{5x}$
$f''(x) = 25e^{5x}$

A) $f(x) = e^{5x} = \frac{1x^0}{0!} + \frac{5x^1}{1!} + \frac{25x^2}{2!} + \dots \frac{(5x)^n}{n!} + \dots = \sum_{n=0}^{\infty} \frac{(5x)^n}{n!}$

$f(x) = e^{5x} = 1 + 5x + \frac{25x^2}{2} + \dots \frac{(5x)^n}{n!} + \dots \sum_{n=0}^{\infty} \frac{(5x)^n}{n!}$

$-\infty < x < \infty$

$f(x) = e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots \frac{x^n}{n!} + \dots \sum_{n=0}^{\infty} \frac{x^n}{n!}$

$f(x) = e^{5x} = 1 + (5x) + \frac{(5x)^2}{2!} + \dots \frac{(5x)^n}{n!} + \dots \sum_{n=0}^{\infty} \frac{(5x)^n}{n!}$

B) $f(x) = \ln(1+2x)$

$-1 < x \leq 1$

$f(x) = \ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \dots + \frac{(-1)^{n-1}x^n}{n} - \dots = \sum_{n=1}^{\infty} \frac{(-1)^{n-1}x^n}{n}$

$-\frac{1}{2} < \frac{2x}{2} \leq \frac{1}{2}$

$-\frac{1}{2} < x \leq \frac{1}{2}$

$f(x) = \ln(1+2x) = (2x) - \frac{(2x)^2}{2} + \frac{(2x)^3}{3} - \dots + \frac{(-1)^{n-1}(2x)^n}{n} - \dots = \sum_{n=1}^{\infty} \frac{(-1)^{n-1}(2x)^n}{n}$

$= 2x - \frac{4x^2}{2} + \frac{8x^3}{3} - \dots + \frac{(-1)^{n-1}(2x)^n}{n} - \dots = \sum_{n=1}^{\infty} \frac{(-1)^{n-1}(2x)^n}{n}$

C) $f(x) = \frac{1}{x+5}$

$f(x) = \frac{1^{st}\ term}{1 - r}$

$f(x) = \frac{\frac{1}{5}}{\frac{x}{5} + \frac{5}{5}}$

$\frac{1}{5} \cdot \frac{-x}{5} = \frac{-x}{25} \cdot \frac{-x}{5}$

I.O.C
$-1 < \frac{-x}{5} < 1$

$1^{st}\ term = \frac{1}{5}$

$r = -\frac{x}{5}$

$f(x) = \frac{\frac{1}{5}}{1 + \frac{x}{5}}$

$f(x) = \frac{1/5}{1 - (-\frac{x}{5})} = \frac{1}{5} - \frac{x^1}{25} + \frac{x^2}{125} - \dots \frac{(-1)^{n-1}x^{n-1}}{5^n} + \dots \sum_{n=1} \frac{(-1)^{n-1}x^{n-1}}{5^n}$

$5^1 \quad 5^2 \quad 5^3$

$\frac{(-1)^n x^n}{5^{n+1}} + \dots \sum_{n=0}^{\infty} \frac{(-1)^n x^n}{5^{n+1}}$