3.27 $P(x) = f(c) + f'(c)(x-c) + \frac{f''(c)(x-c)^2}{2!} + \frac{f'''(c)}{3!}(x-c)^3$

5. $\frac{x^2}{(x-5)^2} = \left(\frac{x}{x-5}\right)^2 = \left(\frac{1}{1-\frac{5}{x}}\right)^2 = \frac{1}{1-\left(\frac{5}{x}\right)^2} = \boxed{\sum_{n=0}^{\infty} \left(\frac{5}{x}\right)^{2n}}$

n	$f^{(n)}(x)$
0	$\left(\frac{x}{x-5}\right)^2$
1	$2\left(\frac{x}{x-5}\right) \cdot \frac{-5}{(x-5)^2} = \frac{-10x}{(x-5)^3}$
2	$\frac{3(x-5)^2 \cdot -10 - (-10)(x-5)^3}{(x-5)^6} = \frac{-20x-50}{(x-5)^4}$
3	

Endless

6. $f(x) = x^{10}e^{2x} = (x^5e^x)^2$ $\quad f^{(8)}(0) = 8!\,c_8$

$f(x)\ \cancel{x^{10}} \rightarrow \sum_{n=0}^{\infty} \frac{x^{2n+10}}{n!}$ $\quad \boxed{\text{Index } n \neq -1 \quad f^{(8)}(0) = 0}$

7. a. $\cos(x) = \sum_{n=0}^{\infty} \frac{(-1)^n \left(x^{3/2}\right)^{2n}}{(2n)!} = \boxed{\sum_{n=0}^{\infty} \frac{(-1)^n x^{3n}}{(2n)!}}$

b. Ratio Test

Abs ✓ conv $\lim_{n\to\infty} \frac{(-1)^{n+1} x^{3n+3}}{(2n+2)(2n)!} \cdot \frac{(2n)!}{(-1)^n x^{3n}} = x^3 \lim_{n\to\infty} \frac{-1}{(2n+2)} \rightarrow 0<1$ Abs conv

$\boxed{R = \infty \quad IOC\ (-\infty, \infty)}$

c. The power series for $\cos(x^{3/2})$ is not a correct representation of the function because the IOC is from $(-\infty,\infty)$ however, $\cos(x^{3/2})$ domain is restricted to $x>0$, Excluding half of the IOC's possibilities