Key

QUIZ 14

1. (5 points) Find the Taylor series expansion for the function $f(x) = x^5 - 5x^2 + 7x - 1$ centered about $a = -1$. (Be sure to state the Taylor series expansion formula.)

n	$f^{(n)}(x)$	$f^{(n)}(-1)$	$n!$	$\frac{f^{(n)}(-1)}{n!}$
0	$f(x)$	-14	1	-14
1	$5x^4 - 10x + 7$	22	1	22
2	$20x^3 - 10$	-30	2	-15
3	$60x^2$	60	6	10
4	$120x$	-120	24	-5
5	120	120	120	1

$$f(x) = -14 + 22(x+1) - 15(x+1)^2 + 10(x+1)^3 - 5(x+1)^4 + (x+1)^5$$

2. (5 points) Use the Maclaurin series expansion for $\cos x$ to find the power series for $\cos x^4$ centered about $a = 0$. (Be sure to write out at least the first 4 non-zero terms of the power series.)

$$\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \frac{x^8}{8!} - \frac{x^{10}}{10!} + \cdots$$

$$\cos(x^4) = 1 - \frac{(x^4)^2}{2!} + \frac{(x^4)^4}{4!} - \frac{(x^4)^6}{6!} + \frac{(x^4)^8}{8!} - \frac{(x^4)^{10}}{10!} + \cdots$$

$$= 1 - \frac{x^8}{2!} + \frac{x^{16}}{4!} - \frac{x^{24}}{6!} + \frac{x^{32}}{8!} - \frac{x^{40}}{10!} + \cdots$$

$$\text{OR} = \sum_{n=0}^{\infty} \frac{(-1)^n x^{8n}}{(2n)!}$$