B.1 $f(x) = \sqrt[3]{1+x}$, $n=5$

$$f(x) = (1+x)^{\frac{1}{3}} = 1 + \frac{1}{3}x + \frac{\frac{1}{3}(\frac{1}{3}-1)}{2!}x^2 + \frac{\frac{1}{3}(-\frac{2}{3})(-\frac{2}{3}-1)}{3!}x^3 +$$

$$+ \frac{\frac{1}{3}(-\frac{2}{3})(\frac{5}{3})(-\frac{5}{3}-1)}{4!}x^4 + \frac{\frac{1}{3}(\frac{2}{3})\cdot\frac{5}{3}\cdot(-\frac{8}{3})\cdot(-\frac{8}{3})\cdot(-\frac{8}{3}-1)}{5!}x^5 +$$

$$+ o(x^5) = 1 + \frac{1}{3}x - \frac{1}{9}x^2 + \frac{5}{81}x^3 - \frac{10}{243}x^4 + \frac{22}{729}x^5 + o(x^5)$$

B.3 $n=5$ $f(x) = \frac{1}{1+x} = (1+x)^{-1} = 1 - x + \frac{-1\cdot(-2)}{2!}x^2 + \frac{2(-3)}{6!}x^3 +$

$$+ \frac{2\cdot(-3)(-4)}{4!}x^4 + \frac{2\cdot 12\cdot(-5)}{5!}x^5 + o(x^5) = 1 - x + x^2 - x^3 + x^4 - x^5 + o(x^5)$$

B.5 $n=5$ $f(x) = ch(x) = \frac{e^x + e^{-x}}{2} = \frac{1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \frac{x^5}{5!} + 1 - x + \frac{x^2}{2} - \frac{x^3}{3} + \frac{x^4}{4} - \frac{x^5}{5}}{2} =$

$$= \frac{2 + 2\frac{x^2}{2!} + 2\frac{x^4}{4}}{2} = 1 + \frac{x^2}{2} + \frac{x^4}{24} + o(x^5)$$

B.4

B.13

13.6 $n=5$

$$f(x)=sh(x)=\frac{e^x-e^{-x}}{2}=\frac{1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\frac{x^4}{4!}+\frac{x^5}{5!}-1+x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4!}+\frac{x^5}{5!}}{2}$$

$$=\frac{2x+2\frac{x^3}{3!}+2\frac{x^5}{5!}}{2}=x+\frac{x^3}{3!}+\frac{x^5}{5!}+o(x^5)$$

13.9

$$f(x)=e^{2x-x^2}=1+(2x-x^2)+\frac{(2x-x^2)^2}{2!}+\frac{(2x-x^2)^3}{3!}+\frac{(2x-x^2)^4}{4!}+$$

$$+\frac{(2x-x^2)^5}{5!}=1+2x-x^2+\frac{4x^2-4x^3+x^4}{2}+\frac{6x^5-12x^4+8x^3+o(x)}{6}+$$

$$+\frac{16x^4-32x^5+o(x)}{24}+\frac{32x^5}{120}=1+2x-x^2+2x^2-2x^3+\frac{x^4}{2}+x^5-2x^4+$$

$$+\frac{4}{3}x^3+\frac{2}{3}x^4-\frac{4}{3}x^5+\frac{4}{15}x^5+o(x^5)=1+2x+x^2-\frac{2}{3}x^3-\frac{5x^4}{6}-\frac{x^5}{15}+$$

$$+o(x^5)$$

13.10 $n=5$

$$f(x)=\sin(\sin x)$$

$$g(x)=\sin x=x-\frac{x^3}{3!}+\frac{x^5}{5!}+o(x^5)$$

$$\sin(g(x))=\left(x-\frac{x^3}{3!}+\frac{x^5}{5!}\right)-\frac{\left(x-\frac{x^3}{3!}+\frac{x^5}{5!}\right)^3}{3!}+\frac{\left(x-\frac{x^3}{3!}+\frac{x^5}{5}\right)^5}{5!}=$$

$$=x-\frac{x^3}{6}+\frac{x^5}{120}-\frac{x^3-\frac{1}{2}x^5+o(x)}{6}+\frac{x^5+o(x^5)}{120}=x-\frac{x^3}{6}+\frac{x^5}{120}-$$

$$-\frac{x^3}{6}+\frac{x^5}{12}+\frac{x^5}{120}+o(x^5)=x-\frac{x^3}{3}+\frac{x^5}{10}+o(x^5)$$

13.13

$$\lim_{x\to 0}\frac{e^x\sin x-x(1+x)}{3x^3}=\lim_{x\to 0}\frac{\left(1+x+\frac{x^2}{2}\right)\left(x-\frac{x^3}{6}\right)-x-x^2}{3x^3}=$$

$$=\lim_{x\to 0}\frac{x+x^2+\frac{x^3}{2}-\frac{x^3}{6}-x-x^2}{3x^3}=\frac{\frac{2x^3}{6}}{3\cdot 3x^3}=\frac{1}{9}$$