Assignment 12 Problem Three

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3. The following is a power series representation of tan(x) $x + \frac{x^3}{3} + \frac{2x^5}{15} + \frac{17x^7}{315} + \frac{62x^9}{2835}...$

(a) First five terms for the PSR of $ln(|sec(x)|)$

$ln(|sec(x)|) = ln(|\frac{1}{cos(x)}|) = ln(1) - ln(|cos(x)|) = -ln(|cos(x)|)$

Let $g(x) = -ln(|cos(x)|)$

$g'(x) = -\frac{sin(x)}{cos(x)} = -tan(x)$

$g'(x) = -(x + \frac{x^3}{3} + \frac{2x^5}{15} + \frac{17x^7}{315} + \frac{62x^9}{2835}) = -x - \frac{x^3}{3} - \frac{2x^5}{15} - \frac{17x^7}{315} - \frac{62x^9}{2835}$

Integrating back to get $g(x)$ we get:

$-(\frac{1}{2})x^2 - (\frac{1}{4})\frac{x^4}{3} - (\frac{1}{6})\frac{2x^6}{15} - (\frac{1}{8})\frac{17x^8}{315} - (\frac{1}{10})\frac{62x^{10}}{2835} = -\frac{x^2}{2} - \frac{x^4}{12} - \frac{x^6}{45} - \frac{17x^8}{2520} - \frac{31x^{10}}{14175}$

(b) First five terms of the PSR for $sec^2(x)$

Let $f(x) = tan(x) = x + \frac{x^3}{3} + \frac{2x^5}{15} + \frac{17x^7}{315} + \frac{62x^9}{2835}...$

$f'(x) = sec^2(x) = 1 + x^2 + \frac{2x^4}{3} + \frac{17x^6}{45} + \frac{62x^8}{315}$