MTH 264, Quiz #10, Spring 2024 Name KEY

Instructions: Work the problems below as directed. Show all work. Clearly mark your final answers. Use exact values unless the problem specifically directs you to round. Simplify as much as possible. Partial credit is possible, but solutions without work will not receive full credit.

1. Find the Taylor Series for the given function, for the given number of terms, centered at the given point. (Show the work. Do not use the table of functions for this question.)

   a. $f(x) = \ln(2x+1), n = 4, c = 0$

n	$n!$	$f^{(n)}(x)$	$f^{(n)}(c)$	$(x-c)^n$	$\frac{f^{(n)}(c)(x-c)^n}{n!}$
0	1	$\ln(2x+1)$	0	1	0
1	1	$\frac{2}{2x+1}$	2	x	$2x$
2	2	$\frac{-4}{(2x+1)^2}$	-4	x^2	$-4x^2/2 = -2x^2$
3	6	$\frac{16}{(2x+1)^3}$	16	x^3	$16x^3/6 = \frac{8x^3}{3}$
4	24	$\frac{-96}{(2x+1)^4}$	-96	x^4	$-96x^4/24 = -4x^4$

$$P_4 = 2x - \frac{4x^2}{2} + \frac{16x^3}{6} - \frac{96x^4}{24}$$

   b. $f(x) = \sqrt{x+1}, n = 6, c = 7$

n	$n!$	$f^{(n)}(x)$	$f^{(n)}(7)$	$(x-c)^n$
0	1	$(x+1)^{1/2}$	$2\sqrt{2} = \sqrt{8}$	$2\sqrt{2}$
1	1	$\frac{1}{2}(x+1)^{-1/2}$	$\frac{1}{2\sqrt{8}} = \frac{1}{4\sqrt{2}}$	$x-7$
2	2	$-\frac{1}{4}(x+1)^{-3/2}$	$-\frac{1}{4}\cdot\frac{1}{\sqrt{512}} = -\frac{1}{4}\cdot\frac{1}{16\sqrt{2}} = \frac{-1}{64\sqrt{2}}$	$(x-7)^2$
3	6	$\frac{3}{8}(x+1)^{-5/2}$	$\frac{3}{8}\cdot\frac{1}{128\sqrt{2}} = \frac{3}{1024\sqrt{2}}$	$(x-7)^3$
4	24	$-\frac{15}{16}(x+1)^{-7/2}$	$\frac{15}{16}\cdot\frac{1}{1024\sqrt{2}} = -\frac{15}{16384\sqrt{2}}$	$(x-7)^4$
5	120	$\frac{105}{32}(x+1)^{-9/2}$	$\frac{105}{32}\cdot\frac{1}{8192\sqrt{2}} = \frac{105}{262144\sqrt{2}}$	$(x-7)^5$
6	720	$-\frac{945}{64}(x+1)^{-11/2}$	$\frac{945}{64}\cdot\frac{1}{65536\sqrt{2}} = \frac{-945}{4194304\sqrt{2}}$	$(x-7)^6$

$$P_6 = 2\sqrt{2} + \frac{1}{4\sqrt{2}}(x-7) - \frac{1}{128\sqrt{2}}(x-7)^2 + \frac{1}{2048\sqrt{2}}(x-7)^3 - \frac{5}{131072\sqrt{2}}(x-7)^4$$

$$+ \frac{7}{2097152\sqrt{2}}(x-7)^5 - \frac{21}{67108864\sqrt{2}}(x-7)^6$$