9.7 Day 1

Wednesday, January 8, 2020 7:29 PM

Pg 644: #1-5, 9, 13, 18, 21, 29, 41, 63, 66

1. d 2. c 3. a 4. b

5. $f(x) = \frac{\sqrt{x}}{4}$ $c = 4$

$f(4) = 1/2$ $f'(x) = \frac{1}{8\sqrt{x}}$ $f'(4) = 1/16$ $P_1 = \frac{1}{2} + \frac{1}{16}(x-4)$

1st Degree polynomial Approx

9.

x	0	0.8	0.9	1	1.1	1.2	2
$f(x)$	und	4.4721	4.2164	4	3.8139	3.6515	2.8284
$P_2(x)$	7.5	4.46	4.215	4	3.815	3.66	3.5

$P_2(x) = 4 - 2(x-1) + \frac{3}{2}(x-1)^2$

$f(x) = 4 \cdot x^{-1/2}$ $f(1) = 4$

$f'(x) = -2x^{-3/2}$ $f'(1) = -2$

$f''(x) = 3x^{-5/2}$ $f''(1) = 3$

13. $f(x) = e^{4x}$ $n = 4$ mac laurin $c = 0$

$P_4(x) = 1 + 4x + 16 \cdot \frac{1}{2}x^2 + 64 \cdot \frac{1}{2} \cdot \frac{1}{3}x^3 + 256 \cdot \frac{1}{2} \cdot \frac{1}{3} \cdot \frac{1}{4}x^4$

$= 1 + 4x + 8x^2 + \frac{64}{3!}x^3 + \frac{256}{4!}x^4$

18. $f(x) = \cos \pi x$ $n = 4$

$f(x) = \cos \pi x$

$f'(x) = -\pi \sin \pi x$

$f''(x) = -\pi^2 \cos \pi x$

$f'''(x) = \pi^3 \sin \pi x$

$f^{(4)}(x) = \pi^4 \cos \pi x$

$P_4(x) = 1 + 0 - \pi^2 \cdot \frac{1}{2}x^2 + 0 \cdot \frac{1}{2} \cdot \frac{1}{3}x^3 + \pi^4 \cdot \frac{1}{2} \cdot \frac{1}{3} \cdot \frac{1}{4}x^4$

$P_4(x) = 1 - \frac{\pi^2 x^2}{2!} + \frac{\pi^4 x^4}{4!}$

21. $f(x) = \frac{1}{x+1}$ $n = 5$ $f(x) = (x+1)^{-1}$ $f' = -(x+1)^{-2}$ $f'' = 2(x+1)^{-3}$

$f''' = -6(x+1)^{-4}$ $f^{(4)}(x) = 24(x+1)^{-5}$

$f^{(5)}(x) = -120(x+1)^{-6}$

$P_5(x) = 1 - x + \frac{2x^2}{2} - \frac{6x^3}{3!} + \frac{24x^4}{4!} - \frac{120x^5}{5!}$

$= 1 - x + x^2 - x^3 + x^4 - x^5$

29. $f(x) = \ln x \quad n=4 \quad c=2$

$f(x) = \ln x$

$f' = \frac{1}{x}$

$f'' = -x^{-2}$

$f''' = 2x^{-3}$

$f^{(4)} = -6x^{-4}$

$$P_4(x) = \ln 2 + \frac{1}{2}(x-2) + \frac{-1}{4}\frac{(x-2)^2}{2!} + \frac{1}{4}\frac{(x-2)^3}{3!} - 6\cdot\frac{1}{16}\frac{(x-2)^4}{4!}$$

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

41. $f(x) = e^{4x} \quad f(1/4)$

From Exercise #13

$$P_4(x) = 1 + 4x + 8x^2 + \frac{64}{3!}x^3 + \frac{256}{4!}x^4$$

≈ 2.708

63. The accuracy should increase and expand out from the center as the degree increases. but does have a limit.

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

$f' = \cos x$

$f'' = -\sin x$

$f''' = -\cos x$

$f^{(4)} = \sin x$

$f^{(5)} = -\cos x$

$g(x) = \cos x$

$g' = -\sin x$

$g'' = -\cos x$

$g''' = \sin x$

$g^{(4)} = \cos x$

a. $P_5 = 0 + x \quad \frac{0x^2}{2!} - 1\cdot\frac{x^3}{3!} + \frac{0x^4}{4!} + 1\frac{x^5}{5!}$

$P_5 = x - \frac{x^3}{3!} + \frac{x^5}{5!}$

$P_5'(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!}$

yep $\cos x$

$P_4 = 1 + 0 + -\frac{x^2}{2!} + 0\frac{x^3}{3!} + \frac{x^4}{4!}$

$P_4 = 1 - \frac{x^2}{2!} + \frac{x^4}{4!}$

$\cos x$???

b. $P_6(x) = -x + \frac{x^3}{3!} - \frac{x^5}{5!}$ $\quad -\sin x$???

$P_6 \quad 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!}$ $\quad \boxed{\cos x}$

yep

$P_6'(x) = -x + \frac{x^3}{3!} - \frac{x^5}{5!}$

yep $\quad P_6'(x) = -x + \frac{x^3}{3!} - \frac{x^5}{5!}$

C. $P_4(x) = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!}$

$P_4'(x) = 0 + 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!}$ yep e^x