Sirindhorn International Institute of Technology
Thammasat University
Department of Common and Graduate Studies

MAS 116: Solution for Problem Set 6 (Part 2)

Semester/Year: 3/2008

Course Title: MAS116 (Mathematics I)

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Textbook: Howard Anton, Irl Bivens, and Stephen Davis, *Calculus*, 8th Edition, Wiley (2005).

Due date: Not Due

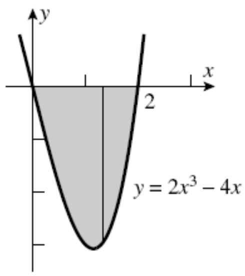
Section 6.1: 2, 8 Section 6.2: 1 Section 6.3: 1, 2, 5 Section 10.5: 12, 14 Section 10.7: 8, 9, 20

Exercise Set 6.1

2. $A = \int_0^4 (\sqrt{x} + x/4)dx = (2x^{3/2}/3 + x^2/8)\Big]_0^4 = 22/3$

8. $A = \int_0^2 [0 - (x^3 - 4x)]dx$

$= \int_0^2 (4x - x^3)dx = 4$



Exercise Set 6.2

1. $V = \pi \int_{-1}^3 (3 - x)dx = 8\pi$

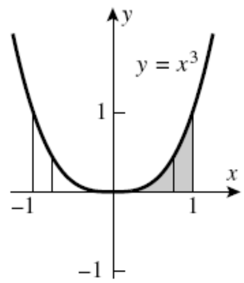
Exercise Set 6.3

1. $V = \int_1^2 2\pi x(x^2)dx = 2\pi \int_1^2 x^3 dx = 15\pi/2$

2. $V = \int_0^{\sqrt{2}} 2\pi x(\sqrt{4 - x^2} - x)dx = 2\pi \int_0^{\sqrt{2}} (x\sqrt{4 - x^2} - x^2)dx = \frac{8\pi}{3}(2 - \sqrt{2})$

5. $V = \int_0^1 2\pi(x)(x^3)dx$

$= 2\pi \int_0^1 x^4 dx = 2\pi/5$



Exercise Set 10.5

12. $\rho = \lim_{k\to+\infty} \frac{4^{k+1}/(k+1)^2}{4^k/k^2} = \lim_{k\to+\infty} \frac{4k^2}{(k+1)^2} = 4$, the series diverges

14. $\rho = \lim_{k\to+\infty} \frac{(k+1)(1/2)^{k+1}}{k(1/2)^k} = \lim_{k\to+\infty} \frac{k+1}{2k} = 1/2$, the series converges

Exercise Set 10.7

8. $f^{(k)}(x) = a^k e^{ax}$, $f^{(k)}(0) = a^k$; $p_0(x) = 1$, $p_1(x) = 1 + ax$, $p_2(x) = 1 + ax + \frac{a^2}{2}x^2$, $p_3(x) = 1 + ax + \frac{a^2}{2}x^2 + \frac{a^3}{3!}x^3$, $p_4(x) = 1 + ax + \frac{a^2}{2}x^2 + \frac{a^3}{3!}x^3 + \frac{a^4}{4!}x^4$; $\sum_{k=0}^{n} \frac{a^k}{k!}x^k$

9. $f^{(k)}(0) = 0$ if k is odd, $f^{(k)}(0)$ is alternately π^k and $-\pi^k$ if k is even; $p_0(x) = 1$, $p_1(x) = 1$, $p_2(x) = 1 - \frac{\pi^2}{2!}x^2$; $p_3(x) = 1 - \frac{\pi^2}{2!}x^2$, $p_4(x) = 1 - \frac{\pi^2}{2!}x^2 + \frac{\pi^4}{4!}x^4$; $\sum_{k=0}^{[\frac{n}{2}]} \frac{(-1)^k \pi^{2k}}{(2k)!}x^{2k}$

NB: The function $[x]$ defined for real x indicates the greatest integer which is $\leq x$.

20. $f^{(k)}(x) = \dfrac{(-1)^k k!}{(x+2)^{k+1}}$, $f^{(k)}(3) = \dfrac{(-1)^k k!}{5^{k+1}}$; $p_0(x) = \dfrac{1}{5}$; $p_1(x) = \dfrac{1}{5} - \dfrac{1}{25}(x-3)$;

$p_2(x) = \dfrac{1}{5} - \dfrac{1}{25}(x-3) + \dfrac{1}{125}(x-3)^2$; $p_3(x) = \dfrac{1}{5} - \dfrac{1}{25}(x-3) + \dfrac{1}{125}(x-3)^2 - \dfrac{1}{625}(x-3)^3$;

$p_4(x) = \dfrac{1}{5} - \dfrac{1}{25}(x-3) + \dfrac{1}{125}(x-3)^2 - \dfrac{1}{625}(x-3)^3 + \dfrac{1}{3125}(x-3)^4$; $\displaystyle\sum_{k=0}^{n} \frac{(-1)^k}{5^{k+1}}(x-3)^k$