Middlebury College

Calculus II: Fall 2017

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Problems on integration

$*$ = standard, similar to exam problems. $**$ = more difficult than exam problems.

1.$*$

$$\int_0^2 \frac{x^3}{\sqrt{x^4+2}}dx$$

2.$*$

$$\int u\sin(u^2)du$$

3.$**$

$$\int \frac{1}{(x-2)^2(x^2+1)}dx$$

4.$*$

$$\int x^2\cos(x)dx$$

5.$*$

$$\int_0^1 s^2\exp(3s)ds$$

6.$*$

$$\int_0^1 \frac{2x^3-1}{x^2+1}dx$$

7.$*$

$$\int \frac{1}{x^2}\cos\left(\frac{1}{x}\right)dx$$

8.$*$

$$\int \frac{\sqrt{x}}{(\sqrt{x^3}+2)^2}dx$$

9.$*$

$$\int \frac{1}{\sqrt{5-4x-x^2}}dx$$

10.$*$

$$\int 2x\sin(x^2)\cos^3(x^2)dx$$

11.$*$

$$\int \frac{1}{(x-2)(x^2+2x+2)}dx$$

12.$**$

$$\int \sqrt{\frac{1}{y}-1}dy$$

13.$*$

$$\int \frac{1}{x^2}\sin\left(\frac{1}{x}\right)dx$$

14.$*$

$$\int (1+\cos(s))\sqrt{s+\sin(s)}ds$$

15.$**$

$$\int x\sin(\log(x))dx$$

16.$*$

$$\int_2^4 \frac{x^3+1}{x^3-1}dx$$

17.$*$

$$\int \frac{\sqrt{x^2-9}}{x}dx$$

18.$*$

$$\int_0^{1/\sqrt{2}} \arcsin(x)dx$$

19.$*$

$$\int \cos^3(t)\sin^3(t)dt$$

20.$*$

$$\int_1^2 \frac{\sqrt{1+\log(x)}}{x}dx$$

21.$*$

$$\int_{\pi/6}^{\pi/2} \frac{\cos(x)}{\sin(x)+\sin^3(x)}dx$$

22.∗

$$\int \frac{x^2}{(1+x^2)^{3/2}}dx$$

23.∗

$$\int_0^{\pi/4} \sec^2(x)(\exp(\tan(x))+1)dx$$

24.∗

$$\int_0^{\sqrt{5}} x\sqrt{5-x^2}dx$$

25.∗

$$\int 3\sin(3x)\cos(3x)dx$$

Problems on arc length and surface area

1. Find the arc length of the graph of $f(x) = \frac{x^4}{8} + \frac{1}{4x^2}$ between $x = 1$ and $x = 3$.
2. Find the arc length of the graph of $y = \frac{x^4-12x+3}{6x}$ between $x = 2$ and $x = 4$.
3. Find the arc length of the graph of $f(x) = \frac{\sqrt{x}}{6}(4x - 3)$ between $x = 1$ and $x = 9$.
4. Find the surface area of the surface of revolution (about the x-axis) obtained from $f(x) = \sqrt{x+1}$, $0 \le x \le 2$.
5. Find the surface area of the surface of revolution (about the x-axis) obtained from $f(x) = \cos(x)$, $-\frac{\pi}{2} \le x \le \frac{\pi}{2}$.
6. Find the surface area of the surface of revolution (about the y-axis) obtained from the graph $y = \log(x)$, $2 \le x \le 3$.