

MATHEMATICAL ANALYSIS

PROBLEMS LIST 11

11.12.08

(1) Compute the indefinite integral $\int f(x) dx$ where $f(x)$ is given

by the formula:

- (a) $\frac{5x^2 - 12}{(x^2 - 6x + 13)^2}$, (b) $\arctan x$, (c) $\arctan \sqrt{x}$,
 (d) $\frac{1}{1 + \sqrt{x+1}}$, (e) $x^2 \log(x+1)$, (f) $\frac{x}{(x+1)(2x+1)}$,
 (g) $\frac{x}{x^2 - 7x + 10}$, (h) $\frac{x-2}{x^2 - 7x + 12}$, (i) $\frac{x}{2x^2 - 3x - 2}$,
 (j) $\frac{4x+3}{(x-2)^3}$, (k) $\frac{x^3+1}{x^3-x^2}$, (l) $\frac{x^4}{x^2+1}$,
 (m) $\frac{1}{(x^2+9)^3}$, (n) $\frac{x^3+x-1}{(x^2+2)^2}$, (o) $\frac{\sqrt{x}}{\sqrt{x}-\sqrt[3]{x}}$,
 (p) $\frac{1}{x\sqrt{x+1}}$, (q) $\frac{1}{1+\sqrt[3]{x+1}}$, (r) $\frac{e^x-1}{e^x+1}$ ($t = e^x$),
 (s) $\log(1+x^2)$, (t) $\frac{x^2}{1+x^3}$, (u) $x \cdot \log(x^2+1)$,
 (v) $\frac{1}{x^2-x-1}$, (w) $\frac{7x^6+3x^2+4x}{x^7+x^3+2x^2+4}$, (x) $\sqrt{x} \cdot \log x$,
 (y) $\frac{e^x}{e^{2x}+1}$, (z) $\frac{e^{2x}}{e^{2x}+1}$, (aa) $\frac{e^x}{e^{3x}-1}$,
 (ab) $\frac{1}{(x+1)\sqrt{x}}$, (ac) $\frac{\sqrt{x+1}+1}{\sqrt{x+1}-1}$, (ad) $\frac{1}{x^6+x^4}$,
 (ae) $\frac{1}{(x^2+2x+2)(x^2-4)}$, (af) $\frac{1}{\sqrt{1+\sqrt[3]{x+2}}}$,
 (ag) $\frac{x^4}{x^{15}-1}$, (ah) $\frac{1}{x^4+1}$, (ai) $x^2 \arctan x$,
 (aj) $\frac{2x^2+41x-91}{(x-1)(x+3)(x-4)}$.

(2) Express I_n in the terms of I_{n-1} or I_{n-2}

$$(a) \ I_n(x) = \int \frac{1}{(x^2 + 4)^n} dx, \quad (b) \ I_n(x) = \int x^n e^x dx,$$

$$(c) \ I_n(x) = \int \sin^n x dx, \quad (d) \ I_n(x) = \int x^n \sin x dx,$$

$$(e) \ I_n(x) = \int \log^n x dx, \quad (f) \ I_n(x) = \int x^n e^{x^2} dx.$$