**201-SH3-AB - Exercises #11: Improper Integrals**

Evaluate the following improper integrals.

(1) $\displaystyle\int_1^{\infty} \frac{3}{x^4}\,dx$

(2) $\displaystyle\int_4^{\infty} \frac{2}{x^{3/2}}\,dx$

(3) $\displaystyle\int_1^{\infty} \frac{4}{x}\,dx$

(4) $\displaystyle\int_0^{\infty} e^{-x}\,dx$

(5) $\displaystyle\int_{-\infty}^{0} e^{2x}\,dx$

(6) $\displaystyle\int_0^1 \frac{dx}{\sqrt{x}}$

(7) $\displaystyle\int_{-1}^{0} \frac{dx}{x^2}$

(8) $\displaystyle\int_4^{\infty} \frac{6}{(4-3x)^{1/3}}\,dx$

(9) $\displaystyle\int_{-\infty}^{1} \frac{4x-6}{(x^2-3x+3)^3}\,dx$

(10) $\displaystyle\int_1^{\infty} \frac{6x}{9+x^2}\,dx$

(11) $\displaystyle\int_{-\infty}^{-2} \frac{2x^3+1}{(x^4+2x)^3}\,dx$

(12) $\displaystyle\int_1^{\infty} 6x^2 e^{1-x^3}\,dx$

(13) $\displaystyle\int_0^{\infty} \frac{9x^2}{(x^3+1)^{5/3}}\,dx$

(14) $\displaystyle\int_0^{\infty} \frac{x^2+1}{(x^3+3x+4)^{5/2}}\,dx$

(15) $\displaystyle\int_0^1 \frac{2x+7}{\sqrt[3]{x^2+7x-8}}\,dx$

(16) $\displaystyle\int_0^1 \frac{e^{2x}}{1-e^{2x}}\,dx$

(17) $\displaystyle\int_1^2 \frac{2x^2+1}{\sqrt{(2x^3+3x-5)^3}}\,dx$

(18) $\displaystyle\int_3^7 \frac{e^{\sqrt{x-3}}}{\sqrt{x-3}}\,dx$

(19) $\displaystyle\int_0^{\frac{\pi}{6}} \frac{3\cos(x)}{(2\sin(x))^{1/3}}\,dx$

(20) $\displaystyle\int_0^1 \frac{e^{\sqrt{x}}}{\sqrt{x}\left(e^{\sqrt{x}}+1\right)^2}\,dx$

(21) $\displaystyle\int_2^{\infty} \frac{2x+1}{\sqrt[4]{x^2+x-2}}\,dx$

(22) $\displaystyle\int_0^{\infty} \frac{4x}{(x^2+1)^4}\,dx$

(23) $\displaystyle\int_{-2}^{0} \frac{6x}{\sqrt{4-x^2}}\,dx$

(24) $\displaystyle\int_2^{\infty} \frac{4}{x\left(\ln(x)\right)^2}\,dx$

(25) $\displaystyle\int_0^{\frac{\pi}{3}} \frac{\sin(3x)}{(1+\cos(3x))^{2/3}}\,dx$

(26) $\displaystyle\int_{-\infty}^{0} \frac{e^{3x}}{(3-e^{3x})^2}\,dx$

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**ANSWERS:**

(1) 1

(2) 2

(3) Diverges

(4) 1

(5) 1/2

(6) 2

(7) Diverges

(8) Diverges

(9) $-1$

(10) Diverges

(11) $-1/576$

(12) 2

(13) 9/2

(14) 1/36

(15) $-6$

(16) Diverges

(17) Diverges

(18) $2(e^2-1)$

(19) 9/4

(20) $1-\frac{2}{e+1}$

(21) Diverges

(22) 2/3

(23) $-12$

(24) $4/\ln(2)$

(25) $\sqrt[3]{2}$

(26) 1/18