860.06. $$\int_0^\infty x^{p-\frac{1}{2}} e^{-ax} dx = \frac{1\cdot 3\cdot 5\cdots(2p-1)}{2^p} \frac{\sqrt{\pi}}{a^{p+\frac{1}{2}}}$$

$[a > 0;\ p = 1,\ 2,\ \ldots]$. [См. **860.07**, второй вид ответа.]

860.07. $$\int_0^\infty x^n e^{-ax} dx = \frac{n!}{a^{n+1}} \qquad [a > 0;\ n = 1,\ 2,\ \ldots],$$

$$= \frac{\Gamma(n+1)}{a^{n+1}} \qquad [a > 0;\ n+1 > 0].$$

860.11. $$\int_0^\infty e^{-r^2x^2} dx = \frac{\sqrt{\pi}}{2r} \qquad [r > 0].$$

860.12. $$\int_0^\infty x e^{-r^2x^2} dx = \frac{1}{2r^2}.$$

860.13. $$\int_0^\infty x^2 e^{-r^2x^2} dx = \frac{\sqrt{\pi}}{4r^3} \qquad [r > 0].$$

860.15. $$\int_0^\infty x^{2a+1} e^{-r^2x^2} dx = \frac{a!}{2r^{2a+2}} \qquad [r > 0;\ a = 1,\ 2,\ \ldots].$$

860.16. $$\int_0^\infty x^{2a} e^{-r^2x^2} dx = \frac{1\cdot 3\cdot 5\cdots(2a-1)}{2^{a+1} r^{2a+1}} \sqrt{\pi} \qquad [r > 0;\ a = 1,\ 2,\ \ldots].$$

860.17. $$\int_0^\infty x^n e^{-r^2x^2} dx = \frac{\Gamma\left(\frac{n+1}{2}\right)}{2r^{n+1}} \qquad [n+1,\ r > 0]$$

(положив $m = 2$ в **860.19**).

860.18. $$\int_0^\infty e^{-(rx)^m} dx = \frac{1}{mr} \Gamma\left(\frac{1}{m}\right) \qquad [r,\ m > 0]$$

(положив $n = 0$ в **860.19**).

860.19. $$\int_0^\infty x^n e^{-(rx)^m} dx = \frac{1}{mr^{n+1}} \Gamma\left(\frac{n+1}{m}\right) \qquad [n+1,\ r,\ m > 0].$$

Все предыдущие формулы **860** могут быть получены из этой при соответствующих значениях n, r и m.

860.21. $$\int_0^\infty \frac{e^{-ax}}{x}\,dx=\infty.$$

860.22. $$\int_0^\infty \frac{e^{-ax}-e^{-bx}}{x}\,dx=\ln\frac{b}{a}$$ $[a,\ b>0]$.

860.23. $$\int_0^\infty \frac{e^{-ax^c}-e^{-bx^c}}{x}\,dx=\frac{1}{c}\ln\frac{b}{a}$$ $[a,\ b,\ c>0]$.

860.24. $$\int_0^\infty \frac{1-e^{-ax^2}}{x^2}\,dx=\sqrt{a\pi}$$ $[a>0]$.

860.25. $$\int_0^\infty e^{-a^2x^2-\frac{b^2}{x^2}}\,dx=\frac{\sqrt{\pi}}{2a}e^{-2ab}$$ $[a,\ b>0]$.

860.30. $$\int_0^\infty \frac{dx}{e^{ax}-1}=\infty$$ $[a>0]$.

860.31. $$\int_0^\infty \frac{x\,dx}{e^{ax}-1}=\frac{\pi^2}{6a^2}$$ $[a>0]$.

860.32. $$\int_0^\infty \frac{x^2dx}{e^{ax}-1}=\frac{2\zeta(3)}{a^3}=\frac{2\cdot 1,202057}{a^3}$$ $[a>0]$.

[См. **48.003.**]

860.33. $$\int_0^\infty \frac{x^3dx}{e^{ax}-1}=\frac{\pi^4}{15a^4}$$ $[a>0]$.

860.37. $$\int_0^\infty \frac{x^{2n-1}dx}{e^{ax}-1}=\frac{(2n-1)!}{a^{2n}}\zeta(2n)=\frac{2^{2n-2}\pi^{2n}}{na^{2n}}B_n$$

$[a>0;\ n=1,\ 2,\ \ldots]$. [См. **45.**]

860.38. $$\int_0^\infty \frac{x^{2n}dx}{e^{ax}-1}.$$ [См. **860.39.**]

860.39. $$\int_0^\infty \frac{x^{p-1}dx}{e^{ax}-1} = \frac{\Gamma(p)}{a^p}\left[1+\frac{1}{2^p}+\frac{1}{3^p}+\ldots\right] = \frac{\Gamma(p)}{a^p}\zeta(p)$$

[$a,\ p>0$; p не обязательно целое число]. [См. **48.09.**]

Таблицу ζ-функции Римана, содержащую и дробные значения аргумента p, см. [16].

860.40. $$\int_0^\infty \frac{dx}{e^{ax}+1} = \frac{\ln 2}{a}$$ [$a>0$]. [См. **601.01.**]

860.41. $$\int_0^\infty \frac{x\,dx}{e^{ax}+1} = \frac{\pi^2}{12a^2}$$ [$a>0$]. [См. **48.22.**]

860.42. $$\int_0^\infty \frac{x^2dx}{e^{ax}+1} = \frac{2!}{a^3}\frac{3}{4}\zeta(3) = \frac{3\cdot 1,202057}{2a^3}$$ [$a>0$].

[См. **48.003** и **48.23.**]

860.43. $$\int_0^\infty \frac{x^3dx}{e^{ax}+1} = \frac{7}{120}\frac{\pi^4}{a^4}$$ [$a>0$].

860.47. $$\int_0^\infty \frac{x^{2n-1}dx}{e^{ax}+1} = \frac{2^{2n-1}-1}{2n}\frac{\pi^{2n}}{a^{2n}}B_n$$ [$a>0$; $n=1,\ 2,\ \ldots$].

[См. **45** и **48.28.**]

860.48. $$\int_0^\infty \frac{x^{2n}dx}{e^{ax}+1}.$$ [См. **860.49.**]

860.49. $$\int_0^\infty \frac{x^{p-1}dx}{e^{ax}+1} = \frac{\Gamma(p)}{a^p}\left(1-\frac{2}{2^p}\right)\zeta(p)$$

[$a>0$; $p>1$; p не обязательно целое число].
[См. **48.29.**] [Для $p=1$ см. **860.40.**]

860.500. $$\int_0^\infty \frac{dx}{\operatorname{sh} ax} = \int_0^\infty \frac{2dx}{e^{ax}-e^{-ax}} = \infty.$$

860.501. $$\int_0^\infty \frac{x\,dx}{\operatorname{sh} ax} = \frac{\pi^2}{4a^2}$$ [$a>0$].

860.502. $\int_0^\infty \frac{x^2dx}{\operatorname{sh} ax} = 2\,(2!)\left(1 + \frac{1}{3^3} + \frac{1}{5^3} + \frac{1}{7^3} + \ldots\right)/a^3,$

$= \frac{7}{2a^3}\,\zeta(3), = 4 \cdot 1{,}05180/a^3.$ [См. **48.13.**]

860.503. $\int_0^\infty \frac{x^3dx}{\operatorname{sh} ax} = \frac{\pi^4}{8a^4}$ $[a > 0]$.

860.504. $\int_0^\infty \frac{x^4dx}{\operatorname{sh} ax} = \frac{93}{2} \cdot 1{,}03693/a^5.$

860.507. $\int_0^\infty \frac{x^{2n-1}dx}{\operatorname{sh} ax} = \frac{\pi^{2n}(2^{2n}-1)}{2na^{2n}} B_n$ $[a > 0;\ n = 1,\ 2,\ \ldots]$.

[См. **45** и **48.18.**]

860.508. $\int_0^\infty \frac{x^{2n}dx}{\operatorname{sh} ax}.$ [См. **860.509.**]

860.509. $\int_0^\infty \frac{x^{p-1}dx}{\operatorname{sh} ax} = \frac{2\Gamma(p)}{a^p}\left(1 - \frac{1}{2^p}\right)\zeta(p)$

$[a > 0;\ p > 1;\ p$ не обязательно целое число$]$.
[См. **48.19.**]

860.511. $\int_0^\infty \frac{x\,dx}{\operatorname{sh}^2 ax} = \infty.$

860.512. $\int_0^\infty \frac{x^2dx}{\operatorname{sh}^2 ax} = \frac{\pi^2}{6a^3}$ $[a > 0]$.

860.513. $\int_0^\infty \frac{x^3dx}{\operatorname{sh}^2 ax} = \frac{3}{2} \cdot 1{,}202057/a^4.$

860.514. $\int_0^\infty \frac{x^4dx}{\operatorname{sh}^2 ax} = \frac{\pi^4}{30a^5}$ $[a > 0]$.

860.518. $\int_0^\infty \frac{x^{2n}dx}{\operatorname{sh}^2 ax} = \frac{\pi^{2n}}{a^{2n+1}} B_n$ $[a > 0]$. [См. **45.**]

860.519. $$\int_0^\infty \frac{x^p dx}{\operatorname{sh}^2 ax} = \frac{\Gamma(p+1)}{2^{p-1}a^{p+1}}\left(1+\frac{1}{2^p}+\frac{1}{3^p}+\frac{1}{4^p}+\ldots\right) = \frac{\Gamma(p+1)}{2^{p-1}a^{p+1}}\zeta(p)$$

[$a > 0$; $p > 1$; p не обязательно целое число]. [См. **48.09.**]

860.530. $$\int_0^\infty \frac{dx}{\operatorname{ch} ax} = \int_0^\infty \frac{2dx}{e^{ax}+e^{-ax}} = \frac{\pi}{2a} \qquad [a > 0].$$ [См. **679.10.**]

860.531. $$\int_0^\infty \frac{x\,dx}{\operatorname{ch} ax} = 2G/a^2 = 2\cdot 0{,}9159656/a^2.$$ [См. **48.32.**]

860.532. $$\int_0^\infty \frac{x^2 dx}{\operatorname{ch} ax} = \frac{\pi^3}{8a^3} \qquad [a > 0].$$

860.533. $$\int_0^\infty \frac{x^3 dx}{\operatorname{ch} ax} = 12\cdot 0{,}98894455/a^4.$$ [См. **48.34.**]

860.534. $$\int_0^\infty \frac{x^4 dx}{\operatorname{ch} ax} = \frac{5}{32}\frac{\pi^5}{a^5} \qquad [a > 0].$$

860.538. $$\int_0^\infty \frac{x^{2n} dx}{\operatorname{ch} ax} = \frac{\pi^{2n+1}}{(2a)^{2n+1}}E_n \qquad [a > 0;\ n = 0,\ 1,\ 2,\ \ldots].$$ [См. **45.**]

860.539. $$\int_0^\infty \frac{x^{p-1} dx}{\operatorname{ch} ax} = \frac{2\Gamma(p)}{a^p}\left(1-\frac{1}{3^p}+\frac{1}{5^p}-\frac{1}{7^p}+\ldots\right) \qquad [a,\ p > 0].$$

Для целых значений p см. **48.31—.39**. Для p нецелых сумму ряда приходится находить численно.

860.541. $$\int_0^\infty \frac{x\,dx}{\operatorname{ch}^2 ax} = \frac{\ln 2}{a^2}.$$

860.542. $$\int_0^\infty \frac{x^2 dx}{\operatorname{ch}^2 ax} = \frac{\pi^2}{12a^3} \qquad [a > 0].$$

860.543. $$\int_0^\infty \frac{x^3\,dx}{\operatorname{ch}^2 ax} = \frac{9}{8}\cdot 1{,}202057/a^4 = \frac{9}{8}\frac{\zeta(3)}{a^4}.$$

860.544. $\int\limits_0^\infty \frac{x^4\,dx}{\operatorname{ch}^2 ax} = \frac{7}{240}\,\frac{\pi^4}{a^5}$ $[a > 0]$.

860.548. $\int\limits_0^\infty \frac{x^{2n}\,dx}{\operatorname{ch}^2 ax} = \frac{(2^{2n-1}-1)}{2^{2n-1}a^{2n+1}}\,\pi^{2n}B_n$ $[a > 0;\ n = 1,\ 2,\ \ldots]$.

[См. 45.]

860.549. $\int\limits_0^\infty \frac{x^p\,dx}{\operatorname{ch}^2 ax} = \frac{\left(1-\frac{2}{2^p}\right)}{2^{p-1}}\,\frac{\Gamma(p+1)}{a^{p+1}}\,\zeta(p)$ $[a > 0;\ p > 1]$.

При $p = 1$ см. **860.541.** [См. **48.29.**]

860.80. $\int\limits_0^\infty e^{-ax}\sin mx\,dx = \frac{m}{a^2+m^2}$ $[a > 0]$.

860.81. $\int\limits_0^\infty xe^{-ax}\sin mx\,dx = \frac{2am}{(a^2+m^2)^2}$ $[a > 0]$.

860.82. $\int\limits_0^\infty x^2e^{-ax}\sin mx\,dx = \frac{2m(3a^2-m^2)}{(a^2+m^2)^3}$ $[a > 0]$.

860.89. $\int\limits_0^\infty x^{p-1}e^{-ax}\sin mx\,dx = \frac{\Gamma(p)\sin p\theta}{(a^2+m^2)^{p/2}}$ $[p,\ a,\ m > 0]$,

где $\sin\theta = m/r$, $\cos\theta = a/r$, $r = (a^2+m^2)^{1/2}$.

860.90. $\int\limits_0^\infty e^{-ax}\cos mx\,dx = \frac{a}{a^2+m^2}$ $[a > 0]$.

860.91. $\int\limits_0^\infty xe^{-ax}\cos mx\,dx = \frac{a^2-m^2}{(a^2+m^2)^2}$ $[a > 0]$.

860.92. $\int\limits_0^\infty x^2e^{-ax}\cos mx\,dx = \frac{2a(a^2-3m^2)}{(a^2+m^2)^3}$ $[a > 0]$.

860.99. $\int\limits_0^\infty x^{p-1}e^{-ax}\cos mx\,dx = \frac{\Gamma(p)\cos p\theta}{(a^2+m^2)^{p/2}}$

$[a,\ p > 0]$, определение θ см. в **860.89.**

861.01. $$\int_0^\infty \frac{e^{-ax}}{x} \sin mx\, dx = \operatorname{arctg} \frac{m}{a} \qquad [a > 0].$$

861.02. $$\int_0^\infty \frac{e^{-ax}}{x} \cos mx\, dx = \infty.$$

861.03. $$\int_0^\infty \frac{e^{-ax}}{x} (1 - \cos mx)\, dx = \frac{1}{2} \ln \left(1 + \frac{m^2}{a^2}\right) \qquad [a > 0].$$

861.04. $$\int_0^\infty \frac{e^{-ax}}{x} (\cos mx - \cos nx)\, dx = \frac{1}{2} \ln \frac{a^2 + n^2}{a^2 + m^2} \qquad [a > 0].$$

861.05. $$\int_0^\infty \frac{e^{-ax} - e^{-bx}}{x} \cos mx\, dx = \frac{1}{2} \ln \frac{b^2 + m^2}{a^2 + m^2} \qquad [a,\ b > 0].$$

861.06. $$\int_0^\infty e^{-ax} \cos^2 mx\, dx = \frac{a^2 + 2m^2}{a(a^2 + 4m^2)} \qquad [a > 0].$$

861.10. $$\int_0^\infty e^{-ax} \sin^2 mx\, dx = \frac{2m^2}{a(a^2 + 4m^2)} \qquad [a > 0].$$

861.11. $$\int_0^\infty \frac{e^{-ax}}{x} \sin^2 mx\, dx = \frac{1}{4} \ln \left(1 + \frac{4m^2}{a^2}\right) \qquad [a > 0].$$

861.12. $$\int_0^\infty \frac{e^{-ax}}{x^2} \sin^2 mx\, dx = m \operatorname{arctg} \frac{2m}{a} - \frac{a}{4} \ln \left(1 + \frac{4m^2}{a^2}\right) \qquad [a > 0].$$

861.13. $$\int_0^\infty e^{-ax} \sin mx \sin nx\, dx = \frac{2amn}{\{a^2 + (m-n)^2\}\{a^2 + (m+n)^2\}} \qquad [a > 0].$$

861.14. $$\int_0^\infty e^{-ax} \sin mx \cos nx\, dx = \frac{m(a^2 + m^2 - n^2)}{\{a^2 + (m-n)^2\}\{a^2 + (m+n)^2\}} \qquad [a > 0].$$

861.15. $$\int_0^\infty e^{-ax} \cos mx \cos nx\, dx = \frac{a(a^2 + m^2 + n^2)}{\{a^2 + (m-n)^2\}\{a^2 + (m+n)^2\}} \qquad [a > 0].$$

861.16. $$\int_0^\infty \frac{e^{-ax}}{x}\sin mx \sin nx\, dx = \frac{1}{4}\ln\frac{a^2+(m+n)^2}{a^2+(m-n)^2} \qquad [a>0].$$

861.20. $$\int_0^\infty e^{-a^2x^2}\cos mx\, dx = \frac{\sqrt{\pi}}{2a}e^{-\frac{m^2}{4a^2}} \qquad [a>0].$$

861.21. $$\int_0^\infty xe^{-a^2x^2}\sin mx\, dx = \frac{m\sqrt{\pi}}{4a^3}e^{-\frac{m^2}{4a^2}} \qquad [a>0].$$

861.22. $$\int_0^\infty \frac{e^{-a^2x^2}}{x}\sin mx\, dx = \frac{\pi}{2}\operatorname{erf}\left(\frac{m}{2a}\right) \qquad [a>0].$$

[См. **590.**] Таблицы см. [19б].

861.31. $$\int_0^\infty \frac{e^{-ax}}{\sqrt{x}}\cos mx\, dx = \frac{(a+\sqrt{a^2+m^2})^{1/2}\sqrt{\pi}}{(a^2+m^2)^{1/2}\sqrt{2}} \qquad [a>0].$$

861.32. $$\int_0^\infty e^{-ax}\sin\sqrt{mx}\, dx = \frac{\sqrt{\pi m}}{2a\sqrt{a}}e^{-\frac{m}{4a}} \qquad [a,\ m>0].$$

861.33. $$\int_0^\infty \frac{e^{-ax}}{\sqrt{x}}\cos\sqrt{mx}\, dx = \frac{\sqrt{\pi}}{\sqrt{a}}e^{-\frac{m}{4a}} \qquad [a,\ m>0].$$

861.41. $$\int_0^\infty e^{-ax}\sin(px+q)\, dx = \frac{a\sin q+p\cos q}{a^2+p^2} \qquad [a>0].$$

861.42. $$\int_0^\infty e^{-ax}\cos(px+q)\, dx = \frac{a\cos q-p\sin q}{a^2+p^2} \qquad [a>0].$$

861.51. $$\int_0^{\pi/2} \frac{\operatorname{sh} x}{\sin x}\, dx = \frac{\pi}{2}.$$

861.61. $$\int_0^\infty \frac{\sin mx}{\operatorname{sh} ax}\, dx = \int_0^\infty \frac{2\sin mx}{e^{ax}-e^{-ax}}\, dx = \frac{\pi}{2a}\operatorname{th}\frac{\pi m}{2a} \qquad [a>0].$$

861.62. $$\int_0^\infty \frac{\cos mx}{\operatorname{ch} ax}\, dx = \frac{\pi}{2a\operatorname{ch}\frac{\pi m}{2a}} \qquad [a>0].$$

861.63. $$\int_0^\infty \frac{\operatorname{sh} px}{\operatorname{sh} qx}\,dx = \frac{\pi}{2q}\operatorname{tg}\frac{\pi p}{2q} \qquad [-q<p<q;\ q>0].$$

861.64. $$\int_0^\infty \frac{\operatorname{ch} px}{\operatorname{ch} qx}\,dx = \frac{\pi}{2q\cos\frac{\pi p}{2q}} \qquad [-q<p<q;\ q>0].$$

861.65. $$\int_0^\infty \operatorname{th} qx \sin mx\,dx = \frac{\pi}{2q\operatorname{sh}\frac{\pi m}{2q}} \qquad [q>0].$$

861.66. $$\int_0^\infty \frac{\sin mx}{\operatorname{th} qx}\,dx = \frac{\pi}{2q\operatorname{th}\frac{\pi m}{2q}} \qquad [q>0].$$

861.71. $$\int_0^\infty \frac{\sin mx\cos nx}{\operatorname{sh} ax}\,dx = \frac{\pi\operatorname{sh}\frac{m\pi}{a}}{2a\left(\operatorname{ch}\frac{m\pi}{a}+\operatorname{ch}\frac{n\pi}{a}\right)} \qquad [a>0].$$

861.72. $$\int_0^\infty \frac{\cos mx\cos nx}{\operatorname{ch} ax}\,dx = \frac{\pi\operatorname{ch}\frac{m\pi}{2a}\operatorname{ch}\frac{n\pi}{2a}}{a\left(\operatorname{ch}\frac{m\pi}{a}+\operatorname{ch}\frac{n\pi}{a}\right)} \qquad [a>0].$$

861.73. $$\int_0^\infty \frac{\cos mx}{\operatorname{ch}^2 ax}\,dx = \frac{\pi m}{2a^2\operatorname{sh}\frac{\pi m}{2a}} \qquad [a>0].$$

861.81. $$\int_0^\infty \frac{x\sin mx}{\operatorname{ch} ax}\,dx = \frac{\pi^2}{4a^2}\,\frac{\operatorname{sh}\frac{\pi m}{2a}}{\operatorname{ch}^2\left(\frac{\pi m}{2a}\right)} \qquad [a>0].$$

861.82. $$\int_0^\infty \frac{x\cos mx}{\operatorname{sh} ax}\,dx = \frac{\pi^2}{4a^2\operatorname{ch}^2\left(\frac{\pi m}{2a}\right)} \qquad [a>0].$$

861.83. $$\int_0^\infty \frac{\operatorname{th} ax}{x}\cos mx\,dx = \ln\operatorname{cth}\frac{\pi m}{4a} \qquad [a,\ m>0].$$

862.01. $$\int_0^\infty e^{-ax}\operatorname{sh} bx\,dx=\frac{b}{a^2-b^2}\qquad [a>b\geqslant 0].$$

862.02. $$\int_0^\infty e^{-ax}\operatorname{ch} bx\,dx=\frac{a}{a^2-b^2}\qquad [a>b\geqslant 0].$$

862.03. $$\int_0^\infty xe^{-a^2x^2}\operatorname{sh} bx\,dx=\frac{b\sqrt{\pi}}{4a^3}e^{\frac{b^2}{4a^2}}\qquad [a>0].$$

862.04. $$\int_0^\infty e^{-ax}\operatorname{sh}(b\sqrt{x})\,dx=\frac{b\sqrt{\pi}}{2a\sqrt{a}}e^{\frac{b^2}{4a}}\qquad [a>0].$$

862.11. $$\int_0^\infty \frac{\sin mx}{e^{ax}+1}\,dx=\frac{1}{2m}-\frac{\pi}{2a\operatorname{sh}(\pi m/a)}\qquad [a>m>0].$$

862.12. $$\int_0^\infty \frac{\sin mx}{e^{ax}-1}\,dx=\frac{\pi}{2a\operatorname{th}(\pi m/a)}-\frac{1}{2m}\qquad [a>m>0].$$

862.21. $$\int_0^\infty \frac{\operatorname{sh} px}{e^{ax}+1}\,dx=\frac{\pi}{2a\sin(\pi p/a)}-\frac{1}{2p}\qquad [a>p>0].$$

862.22. $$\int_0^\infty \frac{\operatorname{sh} px}{e^{ax}-1}\,dx=\frac{1}{2p}-\frac{\pi}{2a\operatorname{tg}(\pi p/a)}\qquad [a>p>0].$$

862.31. $$\int_0^\infty \frac{\sin mx\,dx}{(1+x^2)\operatorname{sh}\pi x}=-\frac{m}{2e^m}+(\operatorname{sh} m)\ln(1+e^{-m})\qquad [m>0].$$

862.32. $$\int_0^\infty \frac{\operatorname{th}\frac{\pi x}{2}}{1+x^2}\sin mx\,dx=\frac{m}{e^m}-(\operatorname{sh} m)\ln(1-e^{-2m})\qquad [m>0].$$

862.33. $$\int_0^\infty \frac{\sin mx\,dx}{(1+x^2)\operatorname{th}\frac{\pi x}{2}}=-(\operatorname{sh} m)\ln\operatorname{th}\frac{m}{2}\qquad [m>0].$$

862.41. $$\int_0^\infty \frac{\operatorname{sh} px}{\operatorname{sh} qx}\cos mx\,dx=\frac{\pi}{2q}\,\frac{\sin\frac{p\pi}{q}}{\cos\frac{p\pi}{q}+\operatorname{ch}\frac{m\pi}{q}}$$

$$[-q\leqslant p\leqslant q;\ q>0].$$