The equation we now give is the riemann zeta function valid on the critical strip 0 < Re (s) < 1. if you would like to see a proof of this equation, you can see the equation on wolframalpha.com. Simply type in the search engine on wolframalpha.com the term "riemann zeta function" and look for "integral representations"; click on the top right - hand button in the box where it says "more" and search for equation where it says valid for Re (s) > 0. It is difficult to type the demonstration of the equation here; go to the website. So we begin :

$$\zeta(s) = \frac{2^s}{\left(-2+2^s\right)(\Gamma(s))}\int_0^\infty \frac{t^{-1+s}}{1+e^t}\,dt \text{ for Re } (s) > 0 \text{ (valid on the critical strip)}$$

This is the Riemann Zeta Function, valid on the critical strip. Assume an arbitrary zero, α, of the Riemann Zeta Function above, lies anywhere on the critical strip ($\alpha = a + bi$, where "a" and "b" belong to the reals, and "i" is the imaginary number). We set for the above Zeta Function, on left - hand side of the equation, $s = \alpha$. Therefore :

$$\zeta(\alpha) = 0$$

(Eq .2)

Since the left side of the above Eq .1 is equal to zero by Eq .2, we see the following :

$$0 = \frac{2^s}{\left(-2+2^s\right)(\Gamma(s))}\int_0^\infty \frac{t^{-1+s}}{1+e^t}\,dt$$

(Eq .3)

We take the absolute value of both sides of Eq .3 :

$$0 = \left| \frac{2^s}{(-2+2^s)\ (\Gamma(s))} \right| \left| \int_0^\infty \frac{t^{-1+s}}{1+e^t}\, dt \right|$$

(Eq. 4)

We immediately note that :

$$\left| \frac{2^s}{(-2+2^s)\ (\Gamma(s))} \right| > 0$$

(Eq .5)

We divide both sides of eq. (4) by the left - hand side of inequality (5) , and we get :

$$0 = \left| \int_0^\infty \frac{t^{-1+s}}{1+e^t}\, dt \right|$$

(Eq .6)

Since eq. 6 above is complex for $\alpha = a + bi$, we expand eq. 6 above by complex expansion. Moreover, the expression underneath the integrand is equal to zero. Making use of these two concepts, we conclude :

$0 = \left| \int_0^\infty \frac{t^{-1+s}}{1+e^t}\, dt \right|$ **is equal to the following :**

$$\left| \int_0^\infty \frac{t^{-1+a}\left(\mathrm{Cos}\ (b\,\mathrm{Ln}\ (t)) + i\ \mathrm{Sin}\ (b\,\mathrm{Ln}\ (t))\right)}{1 + e^t}\, dt \right| = 0$$

(by using complex expansion of $t^{-1+\alpha}$, resulting in $t^{-1+\alpha} = t^{-1+a}\left(\mathrm{Cos}\ (b\,\mathrm{Ln}\ (t)) + i\ \mathrm{Sin}\ (b\,\mathrm{Ln}\ (t))\right)$ where $\alpha = a + bi$)

(Eq .7)

We see that since Eq .7 above has an integral, then we see that we can "distribute" over the integral, since integrals are linear functions :

$$\left| \int_0^\infty \frac{t^{-1+a}\,\text{Cos}\,(b\,\text{Ln}\,(t))}{1+e^t}\,dt + i \int_0^\infty \frac{t^{-1+a}\,\text{Sin}\,(b\,\text{Ln}\,(t))}{1+e^t}\,dt \right| = 0$$

(Eq. 8)

We see that in the immediate Eq .8, we took an absolute value of the function

$\int_0^\infty \frac{t^{-1+a}\,\text{Cos}\,(b\,\text{Ln}\,(t))}{1+e^t}\,dt + i \int_0^\infty \frac{t^{-1+a}\,\text{Sin}\,(b\,\text{Ln}\,(t))}{1+e^t}\,dt$ **. Then this absolute value yields :**

$$\left(\int_0^\infty \frac{t^{-1+a}\,\text{Cos}\,(b\,\text{Ln}\,(t))}{1+e^t}\,dt\right)^2 + \left(\int_0^\infty \frac{t^{-1+a}\,\text{Sin}\,(b\,\text{Ln}\,(t))}{1+e^t}\,dt\right)^2 = 0$$

(Eq .9)

Since Eq .9 is equal to zero,
and is also the sum of two non - negative numbers,
then each term in Eq .9 is equal to zero. Therefor we get : ($p^2 = 0$ means that $p = 0$ if p is a real number, like the squared integral in Eq .10 below) :

(Eq .10)

$$\left(\int_0^\infty \frac{t^{-1+a}\,\text{Cos}\,(b\,\text{Ln}\,(t))}{1+e^t}\,dt\right)^2 = 0 \qquad \text{(Eq .10)}$$

Then :

$$\int_0^\infty \frac{t^{-1+a}\,\text{Cos}\,(b\,\text{Ln}\,(t))}{1+e^t}\,dt = 0 \qquad \text{(Eq .11)}$$

(Eq. 11 holds because if the square of a real number is equal to zero, like in Eq .10, then, that real number, is equal to zero)

Then :

$\int_0^\infty \frac{t^{-1+a}\,\text{Cos}\,(b\,\text{Ln}\,(t))}{1+e^t}\,dt = 0$ **is equal to the following :**

$$\int_0^\infty \frac{t^{-1+a}\,\text{Cos}\,((2)\,(1/2)\,b\,\text{Ln}\,(t))}{1+e^t}\,dt = 0 \qquad \text{(Eq .12)}$$

Note the inner function of the cosine in (Eq .12),

where we will use the trigonometric identity $\cos(2x) = (\cos(x))^2 - (\sin(x))^2$, implying that $\text{Cos}((2)(1/2)\, b \,\text{Ln}(t)) = (\text{Cos}((1/2)\, b \,\text{Ln}(t)))^2 - (\text{Sin}((1/2)\, b \,\text{Ln}(t)))^2$ (Eq .12 a)

(Before we continue, we note the use of the trigonometric identity in Eq .12 a; it is valid. The integral in Eq .12 is in an definite integral at a point α = (a, b) (α is the zero in Eq .1). Eq. 12 is an area underneath a curve whose sum total area is zero at the point "α". Because of this, we are justified in using the trigonometric identity in Eq .12 a above.)

Therefore :

$$(\text{Eq .13})\quad 0 = \int_0^\infty \frac{t^{-1+a}\,\text{Cos}((2)(1/2)\, b \,\text{Ln}(t))}{1 + e^t}\, dt =$$

(note inner function of Eq. 13 like in Eq .12 a)

$$(\text{Eq .14})\quad \int_0^\infty \frac{t^{-1+a}\left((\text{Cos}((1/2)\, b \,\text{Ln}(t)))^2 - (\text{Sin}((1/2)\, b \,\text{Ln}(t)))^2\right)}{1 + e^t}\, dt =$$

$$\int_0^\infty \frac{t^{-1+a}\,(\text{Cos}((1/2)\, b \,\text{Ln}(t)))^2}{1 + e^t}\, dt - \int_0^\infty \frac{t^{-1+a}\,(\text{Sin}((1/2)\, b \,\text{Ln}(t)))^2}{1 + e^t}\, dt \qquad (\text{Eq .15})$$

(In Eq .14, we "distribute" over the integral since the integral is a linear function, which yields Eq .15)

So, by Eq. 13 , Eq .14, Eq .15, we see :

$$(\text{Eq. 16})\quad \int_0^\infty \frac{t^{-1+a}\,(\text{Cos}((1/2)\, b \,\text{Ln}(t)))^2}{1 + e^t}\, dt - \int_0^\infty \frac{t^{-1+a}\,(\text{Sin}((1/2)\, b \,\text{Ln}(t)))^2}{1 + e^t}\, dt = 0$$

$$\text{Then :}\quad \int_0^\infty \frac{t^{-1+a}\,(\text{Cos}((1/2)\, b \,\text{Ln}(t)))^2}{1 + e^t}\, dt = \int_0^\infty \frac{t^{-1+a}\,(\text{Sin}((1/2)\, b \,\text{Ln}(t)))^2}{1 + e^t}\, dt \quad (\text{Eq .17})$$

(In Eq .16 above, we see that we move one expression from the left - hand side of Eq. 16 to the right - hand side, yielding Eq .17)

We will now try to show a contradiction; namely, we will demonstrate that Eq .17 is false.

We show the following argument, which is correct by rather simple techniques from mathematical analysis to contradict Eq .17 :

Since the following holds : $e^t \le 1 + e^t$ **for all** $t \in [0, \infty)$ **, implies : (Eq .18)**

$$\frac{e^t}{(e^t)\,(1+e^t)} \le \frac{1+e^t}{(e^t)\,(1+e^t)} \text{ is equivalent to } \frac{1}{(1+e^t)} \le \frac{1}{(e^t)} \quad \text{(Eq .19)}$$

Moreover, we see :

$1 + e^t \le e^t + e^t$ **is equivalent to** $1 + e^t \le 2\,e^t$;
then, by dividing this inequality through by $(1+e^t)\,(e^t+e^t)$**, we get :**

$$\frac{1+e^t}{(1+e^t)\,(e^t+e^t)} \le \frac{e^t+e^t}{(1+e^t)\,(e^t+e^t)} \text{ implies that } \frac{1}{(e^t+e^t)} \le \frac{1}{(1+e^t)} \text{ so that : (Eq .20)}$$

Seeing the inequality of Eq .19 and Eq .20, by transitivity :

$$\frac{1}{(1+e^t)} \le \frac{1}{(e^t)} \text{ and } \frac{1}{(e^t+e^t)} \le \frac{1}{(1+e^t)}, \text{ then, by transitivity :}$$

$$\frac{1}{(e^t+e^t)} \le \frac{1}{(1+e^t)} \le \frac{1}{(e^t)} \quad \text{(Eq. 21)}$$

Now multiply Eq. 21 above by $(\text{Cos}((1/2)\, b\, \text{Ln}(t)))^2$**, where** $(\text{Cos}((1/2)\, b\, \text{Ln}(t)))^2 \ge 0$ **is non - negative so there ' s no change in direction of inequality for Eq .21 :**

$$\frac{(\text{Cos}((1/2)\, b\, \text{Ln}(t)))^2}{(e^t+e^t)} \le \frac{(\text{Cos}((1/2)\, b\, \text{Ln}(t)))^2}{(1+e^t)} \le \frac{(\text{Cos}((1/2)\, b\, \text{Ln}(t)))^2}{(e^t)} \quad \text{(Eq. 22)}$$

Now, multiply Eq .22 above by the term t^{-1+a} **,**
where t^{-1+a} **is greater than zero for all** $t \ge 0$ **and for "a" belonging to interval** $(0, 1/2)$ **:**

$$\frac{t^{-1+a}\,(\text{Cos}((1/2)\, b\, \text{Ln}(t)))^2}{(e^t+e^t)} \le \frac{t^{-1+a}\,(\text{Cos}((1/2)\, b\, \text{Ln}(t)))^2}{(1+e^t)} \le$$

$$\frac{t^{-1+a}\,(\text{Cos}((1/2)\, b\, \text{Ln}(t)))^2}{(e^t)} \quad \text{(Eq. 23)};$$

then, we integrate through the inequality of Eq .23 :

$$\int_0^{\infty} \frac{t^{-1+a}\left(\text{Cos}\left(\left(1/2\right) b \,\text{Ln}(t)\right)\right)^2}{\left(e^t + e^t\right)} \, dt \le$$

$$\int_0^{\infty} \frac{t^{-1+a}\left(\text{Cos}\left(\left(1/2\right) b \,\text{Ln}(t)\right)\right)^2}{\left(1 + e^t\right)} \le \int_0^{\infty} \frac{t^{-1+a}\left(\text{Cos}\left(\left(1/2\right) b \,\text{Ln}(t)\right)\right)^2}{\left(e^t\right)} \quad (\text{Eq .24})$$

The above Eq .24 has 3 parts, the left - hand side, the middle, and the right - hand side. We integrate, using Mathematica (for ease of use), the left - hand side and the right - hand side, yielding the following :

$$\left(1/2\right) \left(\left(1/4\right) \Gamma\left(a - i b\right) + \left(1/4\right) \Gamma\left(a + i b\right) + \left(1/2\right) \Gamma(a)\right) \le$$

$$\int_0^{\infty} \frac{t^{-1+a}\left(\text{Cos}\left(\left(1/2\right) b \,\text{Ln}(t)\right)\right)^2}{\left(1 + e^t\right)} \le$$

$$\left(\left(1/4\right) \Gamma\left(a - i b\right) + \left(1/4\right) \Gamma\left(a + i b\right) + \left(1/2\right) \Gamma(a)\right) \quad (\text{Eq. 25})$$

(The upper and lower bounds of the middle function,

$$\int_0^{\infty} \frac{t^{-1+a}\left(\text{Cos}\left(\left(1/2\right) b \,\text{Ln}(t)\right)\right)^2}{\left(1 + e^t\right)}$$ **, in Eq .25, are all real,**

not complex - valued. To see this, note from Eq. 24 and Eq .25 that

$$\int_0^{\infty} \frac{t^{-1+a}\left(\text{Cos}\left(\left(1/2\right) b \,\text{Ln}(t)\right)\right)^2}{\left(e^t + e^t\right)} \, dt =$$

$$\left(1/2\right) \left(\left(1/4\right) \Gamma\left(a - i b\right) + \left(1/4\right) \Gamma\left(a + i b\right) + \left(1/2\right) \Gamma(a)\right),$$

so that because the left - hand side of this equation is real,

and by consequence, its right - hand.)

So, now we want to show the lower and upper bounds for $\int_0^{\infty} \frac{t^{-1+a}\left(\text{Sin}\left(\left(1/2\right) b \,\text{Ln}(t)\right)\right)^2}{1 + e^t} \, dt$, **as we did in Eq. 25 for** $\int_0^{\infty} \frac{t^{-1+a}\left(\text{Cos}\left(\left(1/2\right) b \,\text{Ln}(t)\right)\right)^2}{\left(1 + e^t\right)}$ **:**

Look at Eq. 22 :

$$\frac{(\text{Cos}((1/2)\,b\,\text{Ln}(t)))^2}{(e^t + e^t)} \le \frac{(\text{Cos}((1/2)\,b\,\text{Ln}(t)))^2}{(1 + e^t)} \le \frac{(\text{Cos}((1/2)\,b\,\text{Ln}(t)))^2}{(e^t)}$$

Replace $(\text{Cos}((1/2)\,b\,\text{Ln}(t)))^2$ with $(\text{Sin}((1/2)\,b\,\text{Ln}(t)))^2$ above (everything still holds, like in the argument we made in Eq .22) , and integrate, like in Eqs. 22 - 24. :

$$\int_0^\infty \frac{t^{-1+a}\,(\text{Sin}((1/2)\,b\,\text{Ln}(t)))^2}{(e^t + e^t)}\,dt \le \int_0^\infty \frac{t^{-1+a}\,(\text{Sin}((1/2)\,b\,\text{Ln}(t)))^2}{(1 + e^t)} \le \int_0^\infty \frac{t^{-1+a}\,(\text{Sin}((1/2)\,b\,\text{Ln}(t)))^2}{(e^t)} \quad (\text{Eq .26})$$

Then :

The above Eq .26 has 3 parts, the left - hand side, the middle, and the right - hand side. We integrate, using Mathematica (for ease of use), the left - hand side and the right - hand side, yielding the following :

$$(1/2)\,((-1/4)\,\Gamma(a - ib) + (-1/4)\,\Gamma(a + ib) + (1/2)\,\Gamma(a)) \le \int_0^\infty \frac{t^{-1+a}\,(\text{Sin}((1/2)\,b\,\text{Ln}(t)))^2}{(1 + e^t)} \le ((-1/4)\,\Gamma(a - ib) + (-1/4)\,\Gamma(a + ib) + (1/2)\,\Gamma(a)) \quad (\text{Eq. }27)$$

Eq. 25 and Eq. 27 are now as follows :

$$(1/2)\,((1/4)\,\Gamma(a - ib) + (1/4)\,\Gamma(a + ib) + (1/2)\,\Gamma(a)) \le \int_0^\infty \frac{t^{-1+a}\,(\text{Cos}((1/2)\,b\,\text{Ln}(t)))^2}{(1 + e^t)} \le ((1/4)\,\Gamma(a - ib) + (1/4)\,\Gamma(a + ib) + (1/2)\,\Gamma(a)) \quad (\text{Eq. }28\,a)$$

$$(1/2)\,((-1/4)\,\Gamma(a - ib) + (-1/4)\,\Gamma(a + ib) + (1/2)\,\Gamma(a)) \le \int_0^\infty \frac{t^{-1+a}\,(\text{Sin}((1/2)\,b\,\text{Ln}(t)))^2}{(1 + e^t)} \le ((-1/4)\,\Gamma(a - ib) + (-1/4)\,\Gamma(a + ib) + (1/2)\,\Gamma(a)) \quad (\text{Eq. }28\,b)$$

Now, to demonstrate a contradiction, note that Eq .17 stated :

$$\int_0^\infty \frac{t^{-1+a}\left(\mathrm{Cos}\left(\left(1/2\right) b\,\mathrm{Ln}(t)\right)\right)^2}{1+e^t}\,dt = \int_0^\infty \frac{t^{-1+a}\left(\mathrm{Sin}\left(\left(1/2\right) b\,\mathrm{Ln}(t)\right)\right)^2}{1+e^t}\,dt \quad (\mathrm{Eq}\ .29)$$

Now substitute $\int_0^\infty \frac{t^{-1+a}\left(\mathrm{Cos}\left(\left(1/2\right) b\,\mathrm{Ln}(t)\right)\right)^2}{1+e^t}$ dt **instead of** $\int_0^\infty \frac{t^{-1+a}\left(\mathrm{Sin}\left(\left(1/2\right) b\,\mathrm{Ln}(t)\right)\right)^2}{(1+e^t)}$ **into Eq. 27;**

we can do this because of the equality of $\int_0^\infty \frac{t^{-1+a}\left(\mathrm{Cos}\left(\left(1/2\right) b\,\mathrm{Ln}(t)\right)\right)^2}{1+e^t}$ dt **and** $\int_0^\infty \frac{t^{-1+a}\left(\mathrm{Sin}\left(\left(1/2\right) b\,\mathrm{Ln}(t)\right)\right)^2}{1+e^t}\,dt$ **concluded in Eq .17 .**

Now, we insert $\int_0^\infty \frac{t^{-1+a}\left(\mathrm{Cos}\left(\left(1/2\right) b\,\mathrm{Ln}(t)\right)\right)^2}{1+e^t}$ **into Eq .27 :**

$$\left(1/2\right)\left(\left(-1/4\right)\Gamma\left(a-ib\right)+\left(-1/4\right)\Gamma\left(a+ib\right)+\left(1/2\right)\Gamma(a)\right) \le \int_0^\infty \frac{t^{-1+a}\left(\mathrm{Cos}\left(\left(1/2\right) b\,\mathrm{Ln}(t)\right)\right)^2}{(1+e^t)} \le \left(\left(-1/4\right)\Gamma\left(a-ib\right)+\left(-1/4\right)\Gamma\left(a+ib\right)+\left(1/2\right)\Gamma(a)\right) \quad (\mathrm{Eq.}\ 30)$$

(Note again that the expression in the middle of above Eq .30 is real, therefore the right - hand side and the left - hand side expressions in above Eq .30 are both real as well.)
Now substitute b = 0 in Eq .30 above :

$$\left(1/2\right)\left(\left(-1/4\right)\Gamma\left(a-i0\right)+\left(-1/4\right)\Gamma\left(a+i0\right)+\left(1/2\right)\Gamma(a)\right) \le \int_0^\infty \frac{t^{-1+a}\left(\mathrm{Cos}\left(\left(1/2\right) 0\,\mathrm{Ln}(t)\right)\right)^2}{(1+e^t)} \le \left(\left(-1/4\right)\Gamma\left(a-i0\right)+\left(-1/4\right)\Gamma\left(a+i0\right)+\left(1/2\right)\Gamma(a)\right) \quad (\mathrm{Eq.}\ 31)$$

Then by b = 0, Eq .31 becomes :

$$\left(1/2\right)\left(\left(-1/4\right)\Gamma(a)+\left(-1/4\right)\Gamma(a)+\left(1/2\right)\Gamma(a)\right) \le \int_0^\infty \frac{t^{-1+a}}{(1+e^t)} \le \left(\left(-1/4\right)\Gamma(a)+\left(-1/4\right)\Gamma(a)+\left(1/2\right)\Gamma(a)\right) \quad (\mathrm{Eq.}\ 32)$$

$\left(\left(\mathrm{Cos}\left(\left(1/2\right) 0\,\mathrm{Ln}(t)\right)\right)^2 = 1\right.$ **for b = 0 in Eq. 31 and Eq .32)**

In Eq .32, the expressions $(1/2)\left(\left(-1/4\right)\Gamma(a)+\left(-1/4\right)\Gamma(a)+\left(1/2\right)\Gamma(a)\right)=0$, and also, the term $\left(\left(-1/4\right)\Gamma(a)+\left(-1/4\right)\Gamma(a)+\left(1/2\right)\Gamma(a)\right)=0$. Then, by Eq .32, we get :

$$0 \le \int_0^\infty \frac{t^{-1+a}}{\left(1+e^t\right)} \le 0 \ (\text{Eq. } 33)$$

Then, by the "Pinch" Theorem in mathematical analysis,

$0 \le \int_0^\infty \frac{t^{-1+a}}{\left(1+e^t\right)} \le 0$ **implies that** $\int_0^\infty \frac{t^{-1+a}}{\left(1+e^t\right)} = 0$ **. Now,** $\int_0^\infty \frac{t^{-1+a}}{\left(1+e^t\right)} = 0$ **for all "a" in interval $(0, 1)$. The proof of this is :**

The above Eq. 33 is easily seen to yield a positive, finite value for the integral, and we see this since :

$$\frac{1}{e^t+e^t} \le \frac{1}{1+e^t} \le \frac{1}{e^t} \Rightarrow \frac{t^{-1+a}}{e^t+e^t} \le \frac{t^{-1+a}}{1+e^t} \le \frac{t^{-1+a}}{e^t} \Rightarrow \int_0^\infty \frac{t^{-1+a}}{e^t+e^t}\,dt \le \int_0^\infty \frac{t^{-1+a}}{1+e^t}\,dt \le \int_0^\infty \frac{t^{-1+a}}{e^t}\,dt \ (\text{Eq. } 34)$$

(by integrating the previous inequality), which implies :

$$\int_0^\infty \frac{t^{-1+a}}{e^t+e^t}\,dt \le \int_0^\infty \frac{t^{-1+a}}{1+e^t}\,dt \le \int_0^\infty \frac{t^{-1+a}}{e^t}\,dt \Rightarrow$$

$$\frac{1}{2}\Gamma(a) \le \int_0^\infty \frac{t^{-1+a}}{1+e^t}\,dt \le \Gamma(a) \text{ since } \int_0^\infty \frac{t^{-1+a}}{e^t+e^t}\,dt = \frac{1}{2}\Gamma(a)$$

(use Mathematica if the integration is too hard; $\Gamma(a)$ is the gamma function). So, since $\frac{1}{2}\Gamma(a)$ is strictly greater than zero for all $0 < a < 1$ (like we said we were working on this interval from the very first few lines of the paper in Eq .1 and Eq .2), and since $\frac{1}{2}\Gamma(a) \le \int_0^\infty \frac{t^{-1+a}}{1+e^t}$, then the value of the integral in Eq. 33 is greater than zero for all "a", contradicting Eq .33. Therefore, in Eq. 17, where it states that

$$\int_0^\infty \frac{t^{-1+a}\left(\text{Cos}\left(\left(1/2\right) b \,\text{Ln}(t)\right)\right)^2}{1+e^t}\,dt = \int_0^\infty \frac{t^{-1+a}\left(\text{Sin}\left(\left(1/2\right) b \,\text{Ln}(t)\right)\right)^2}{1+e^t}\,dt,$$

we see these two expressions are in fact, unequal. Since we have a deductive argument starting from Eq .1 without any errors, then, this contradiction of Eq .17 by the argument leads us to conclude that

the arbitrary zero from Eq .1 - Eq .2, seen as $\alpha = a + bi$ (as an assumption), and lying hypothetically anywhere in the critical strip, does not exist.

I will be further researching on what exactly is the cause of this anomaly in the critical strip; obviously, there can be no zeros in the critical strip with my technique. However, we see by other methods that are involved in the subject of the riemann hypothesis analysis that zeros are supposed to exist on the critical line. So, if you like this paper, please donate to my paypal account; any amount will be more than helpful. My email for the paypal account is vkalaj@gmail.com, and my name, as stated at the top of the paper, is Viktor Kalaj.