

## 25d. Type FF

See §4.5.3.3

In[ \* ]:= **Clear[cff]**

**cff[p\_, r\_, nua\_] =**

$$\text{Sin}[\text{Pi} (nua + j) / 2]^{(-1)} \text{Sin}[\text{Pi} (nua - j) / 2]^{(-1)} \text{c}[p, r, nua] /. \text{gamsub}\left[1 + \frac{1}{2} (nua + p + r + j)\right] /.$$

$$\text{gamsub}\left[1 + \frac{1}{2} (nua + p - r - j)\right] /.$$

$$\text{Sin}\left[\pi \left(1 + \frac{1}{2} (nua + p + r + j)\right)\right] \rightarrow \text{Sin}\left[\pi \left(\frac{1}{2} (nua + j)\right)\right] (-1)^{(1 + (p + r) / 2)} /.$$

$$\text{Sin}\left[\pi \left(1 + \frac{1}{2} (nua + p - r - j)\right)\right] \rightarrow \text{Sin}\left[\pi \left(\frac{1}{2} (nua - j)\right)\right] (-1)^{(1 + (p - r) / 2)} // \text{Simplify}$$

$$\text{Out[ * ]} = \frac{1}{\pi^2} i^{2p} \text{Gamma}\left[\frac{1}{2} (-j - nua - p - r)\right] \text{Gamma}\left[\frac{1}{2} \times (2 - j - nua + p - r)\right]$$

$$\text{Gamma}\left[\frac{1}{2} (j - nua - p + r)\right] \text{Gamma}\left[\frac{1}{2} \times (2 + j - nua + p + r)\right]$$

In[ \* ]:= **cff[p, r, -nu] // lsub[2 j, 0] // Simplify**

**% /. i^{2(a+b)} → (-1)^{(a+b)} // Simplify**

$$\text{Out[ * ]} = \frac{1}{\pi^2} i^{2(a+b)} \left(b - \frac{j}{2} + \frac{nu}{2}\right)! \left(\frac{1}{2} \times (-2 - 2a - j + nu)\right)! \times \left(\frac{1}{2} \times (2a + j + nu)\right)! \times \left(\frac{1}{2} \times (-2 - 2b + j + nu)\right)!$$

$$\text{Out[ * ]} = \frac{1}{\pi^2} (-1)^{a+b} \left(b - \frac{j}{2} + \frac{nu}{2}\right)! \left(\frac{1}{2} \times (-2 - 2a - j + nu)\right)! \times \left(\frac{1}{2} \times (2a + j + nu)\right)! \times \left(\frac{1}{2} \times (-2 - 2b + j + nu)\right)!$$