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In[28]:= (*Define the integrand*)
integrand[r_, b_] := ((r + r^2)^b) / ((1 + r + r^2)^(1 + (3 b) / 2))

(*Symbolically evaluate the integral from 0 to ∞ for b=1 to 10*)
results = Table[FullSimplify[Integrate[integrand[r, b],
    {r, 0, ∞}], Assumptions → b ∈ Integers && b > 0]], {b, 1, 20}];

(*Display as a table with b-values and exact results*)
TableForm[Table[{b, results[[b]]}, {b, 1, 20}],
    TableHeadings → {None, {"b", "Exact Integral Value"}}]

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Out[30]//TableForm=

| b  | Exact Integral Value                          |
|----|---|
| 1  | $\frac{8}{27}$                                |
| 2  | $\frac{4 \pi}{81 \sqrt{3}}$                   |
| 3  | $\frac{64}{2187}$                             |
| 4  | $\frac{4 \pi}{729 \sqrt{3}}$                  |
| 5  | $\frac{1024}{295245}$                         |
| 6  | $\frac{40 \pi}{59049 \sqrt{3}}$               |
| 7  | $\frac{8192}{18600435}$                       |
| 8  | $\frac{140 \pi}{1594323 \sqrt{3}}$            |
| 9  | $\frac{262144}{4519905705}$                   |
| 10 | $\frac{56 \pi}{4782969 \sqrt{3}}$             |
| 11 | $\frac{2097152}{268482398877}$                |
| 12 | $\frac{616 \pi}{387420489 \sqrt{3}}$          |
| 13 | $\frac{33554432}{31412440668609}$             |
| 14 | $\frac{2288 \pi}{10460353203 \sqrt{3}}$       |
| 15 | $\frac{268435456}{1817434067255235}$          |
| 16 | $\frac{2860 \pi}{94143178827 \sqrt{3}}$       |
| 17 | $\frac{17179869184}{834202236870152865}$      |
| 18 | $\frac{97240 \pi}{22876792454961 \sqrt{3}}$   |
| 19 | $\frac{137438953472}{47549527501598713305}$   |
| 20 | $\frac{369512 \pi}{617673396283947 \sqrt{3}}$ |