Math 8701 − Fall 2013 − Problem Set 10

In addition to the problems assigned from Ahlfors, complete the following additional problem:

Compute the value of the following integral (using the positive branch of the square root):

$$\int_0^1 x^{n-2}\sqrt{x(1-x)}\,dx$$

for $n = 2, 3, 4$. Can you give a characterization of the answer for general $n \geq 2$ (especially one that would explain the seemingly needless shift by 2 in the notation)?