

## Special and General Relativity (PHZ 4601/5606) Fall 2018 Solutions

### Set 1

#### 3. Sum of angles in a geodesic triangle on a sphere.

In the notation of Fig. 8.4 the area of the sphere is  $A_S = 4\pi a^2$  and, consequently, for the half-sphere  $A_{S/2} = 2\pi a^2$ . The area of the triangle with  $r = a\pi/2$  is then

$$A_\theta = \frac{\theta}{2\pi} A_{S/2} = \theta a^2.$$

Setting now  $A_\theta = A_S/n = 4\pi a^2/n$  we get

$$\theta = \frac{4\pi}{n}.$$

Each of the other two angles has the values  $\pi/2$ . So we get for the sum of the angles in this triangle:

$$\sum_{\text{triangle}} \text{angles} = \pi + \theta = \pi + \frac{4\pi}{n} = \pi \left(1 + \frac{4}{n}\right).$$