Precession of the Earth's axis (10.0 points)

Part A. The shape of the Earth (1.0 points)

A.1 (0.8 pt)

$\beta =$

$\gamma =$

$\delta =$

A.2 (0.2 pt)

Numerical value of $h_{\text{max}} =$

Part B. The time-averaged gravitational field of the Sun (3.2 points)

B.1 (1.0 pt)

Draw a figure indicating the direction of the gravitational field on the z-axis:

Magnitude of the gravitational field on the z-axis ($|z| \ll d_{SE}$):

B.2 (2.2 pt)

Draw a figure indicating the direction of the gravitational field at a point in the plane of the Sun ring (inside the ring):

Magnitude of the gravitational field in the plane of the ring at a distance r from the centre ($r \ll d_{SE}$):

Part C. The torque acting on the Earth (2.6 points)

C.1 (0.8 pt)

$m =$

C.2 (1.8 pt)

$\tau =$

Part D. Angular speed of the precession of the Earth's axis (2.0 points)

D.1 (1.8 pt)

Formula for the period $T_1 =$

D.2 (0.2 pt)

Numerical value of $T_1 =$

Part E. The effect of the Moon (1.2 points)

E.1 (1.0 pt)

$\frac{T_2}{T_1} =$

E.2 (0.2 pt)

Numerical value of $T_2 =$