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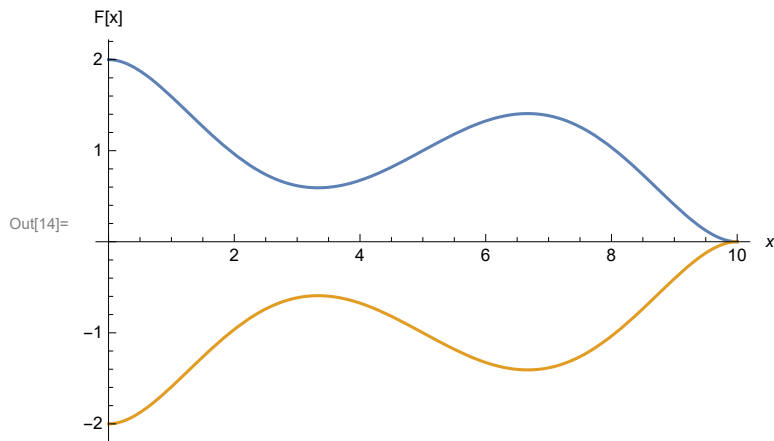
In[7]:= (*Given parameters*)
l = 10; (*length in m*)
radius = 2; (*radius in m*)
γwater = 104; (*specific gravity of water in N/m3*)
γbody = 8 * 104; (*specific gravity of body in N/m3*)
Young = 1 * 107; (*body's elasticity modulus in Pa*)

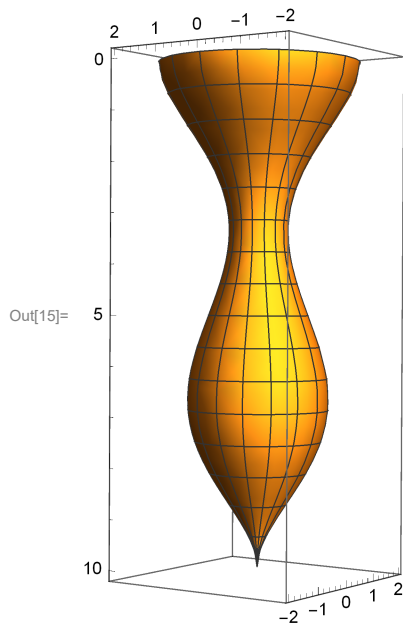
(*Setup of the solid of revolution*)
f[x_, L_, d_] := d +  $\frac{270 * d}{L^5} * \left( -\frac{1}{9} * L^3 * x^2 + \frac{11}{27} * L^2 * x^3 - \frac{L}{2} * x^4 + \frac{x^5}{5} \right)$ ;

(*general profile of body*)
F[x_] := f[x, l, radius]; (*specific profile for length and diameter given*)
Plot[{F[x], -F[x]}, {x, 0, l}, AxesLabel → {x, ToString["F[x]"]}] (*plot of profile*)
RevolutionPlot3D[F[x], {x, 0, l}, RevolutionAxis → {1, 0, 0}]
(*solid of revolution itself*)

(*Calculations required*)
A[x_] := π * F[x]2; (*cross sectional area at depth x in m2*)
Vol[x_] := Integrate[A[y], {y, x, l}]; (*volume of section beneath depth x in m3*)
Force[x_] := (γbody - γwater) * Vol[x]; (*force balancing weight and buoyancy in N*)
del[x_] := NIntegrate[ $\frac{\text{Force}[y]}{\text{Young} * A[y]}$ , {y, 0, x}]; (*Strain at depth x*)
del[l]

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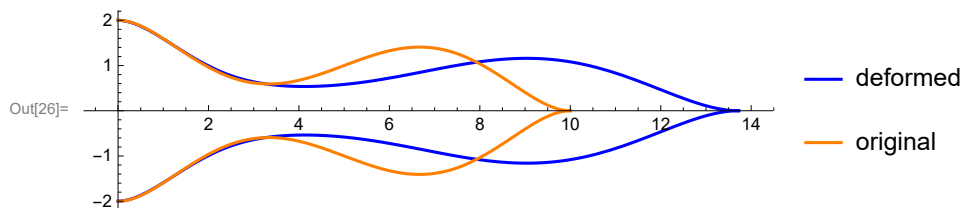


Out[20]= 0.372397

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In[21]:= v = 0.49; (*Poisson's ratio*)
Fnew[x_] := (1 - v * del[x]) * F[x];
posNew[x_] := x * (1 + del[x]);
a1 = ParametricPlot[{posNew[x], Fnew[x]}, {x, 0, 10}, PlotStyle -> Blue];
a2 = ParametricPlot[{posNew[x], -Fnew[x]}, {x, 0, 10}, PlotStyle -> Blue, PlotLegends -> {"deformed"}];
(*a3 = ParametricPlot[{posNew[x], Fnew[x]}, {posNew[x], -Fnew[x]}, {x, 0, 10}, PlotStyle -> Blue, PlotLegends -> {"deformed"}];*)
b1 = Plot[{F[x], -F[x]}, {x, 0, 1}, PlotStyle -> Orange, PlotLegends -> {"original"}];
Show[a1, a2, b1, PlotRange -> All]

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In[27]:= **RevolutionPlot3D**[{Fnew[x], posNew[x]}, {x, 0, 10}]

