```
> restart;

  with(plots);

  unprotect(γ);

  Digits := 20;


  c := 299792458;

  λ := 1.310E−6;


  NumberOfLoops := 15;
  BendRadius := 0.015;
  SingleLoopWidth := 2· BendRadius;
  SingleLoopLength := 0.304;
  TotalArmLength := NumberOfLoops·SingleLoopLength;
  TotalArmWidth := NumberOfLoops·SingleLoopWidth;
  TotalFiberLengthPerArm := evalf(NumberOfLoops·2·(SingleLoopLength + π·BendRadius));

  Altitude := 23·π/180;

  vWind := 420000;

  v := evalf(vWind·abs(cos(Altitude)));


  n1 := 1.44915;
  n2 := 1.44975;

  n := n2;

  γ := evalf(1/(sqrt(1 − (v/c)^2)));


  cn := c/n;
  FractionOfTimeLightIsHeldByMolecules := (n − 1)/n;
  TimeLightIsHeldByMolecules := γ·FractionOfTimeLightIsHeldByMolecules·L/cn;

  t0 := L/cn;
```

$$L1 := \mathrm{sqrt}\left(L^2 + (\mathrm{abs}(v)\cdot dtDiagonal - \mathrm{abs}(v)\cdot TimeLightIsHeldByMolecules)^2\right);$$

$$Eqdt0 := dtDiagonal = t0 + \left(\frac{\mathrm{L1} - \mathrm{L}}{c}\right);$$

$$\theta := \text{'}\theta\text{'};$$

$$unitXcomponent := \mathrm{abs}\left(\cos\left(\theta\right)^2\right);$$

$$unitYcomponent := \mathrm{abs}\left(\sin\left(\theta\right)^2\right);$$

$$TotalArmLengthA := unitXcomponent\cdot TotalArmLength;$$
$$TotalArmWidthA := unitYcomponent\cdot TotalArmWidth;$$
$$TotalArmLengthB := unitYcomponent\cdot TotalArmLength;$$
$$TotalArmWidthB := unitXcomponent\cdot TotalArmWidth;$$

$$L := TotalArmLengthA;$$

$$dtTotalArmLengthA := solve(Eqdt0, dtDiagonal)_1;$$

$$L := TotalArmWidthA;$$

$$dtTotalArmWidthA := solve(Eqdt0, dtDiagonal)_1;$$

$$L := TotalArmLengthB;$$

$$dtTotalArmLengthB := solve(Eqdt0, dtDiagonal)_1;$$

$$L := TotalArmWidthB;$$

$$dtTotalArmWidthB := solve(Eqdt0, dtDiagonal)_1;$$

$$dtPerpendicularArm1 := 2\cdot(dtTotalArmLengthA + dtTotalArmWidthA);$$

$$dtPerpendicularArm2 := 2\cdot(dtTotalArmLengthB + dtTotalArmWidthB);$$

$$L := \text{'}L\text{'};$$

$$TotalArmLengthContractedA := \frac{unitYcomponent \cdot TotalArmLength}{\gamma};$$

$$TotalArmWidthContractedA := \frac{unitXcomponent \cdot TotalArmWidth}{\gamma};$$

$$TotalArmLengthContractedB := \frac{unitXcomponent \cdot TotalArmLength}{\gamma};$$

$$TotalArmWidthContractedB := \frac{unitYcomponent \cdot TotalArmWidth}{\gamma};$$

$$dtParallelArm1 := \frac{TotalArmLengthContractedA + TotalArmWidthContractedA}{\frac{(c+v)}{n}} + \frac{TotalArmLengthContractedA + TotalArmWidthContractedA}{\frac{(c-v)}{n}};$$

$$dtParallelArm2 := \frac{TotalArmLengthContractedB + TotalArmWidthContractedB}{\frac{(c+v)}{n}} + \frac{TotalArmLengthContractedB + TotalArmWidthContractedB}{\frac{(c-v)}{n}};$$

$$dtArm1 := (dtPerpendicularArm1 + dtParallelArm1);$$

$$dtArm2 := (dtPerpendicularArm2 + dtParallelArm2);$$

$$dxArm1 := dtArm1 \cdot c;$$
$$dxArm2 := dtArm2 \cdot c;$$

$$d\theta arm1 := \frac{dxArm1}{\lambda} \cdot 2 \cdot \pi;$$

$$d\theta arm2 := \frac{dxArm2}{\lambda} \cdot 2 \cdot \pi;$$

$$LightIntensityEnvelope := 2 \cdot \sin(d\theta arm1 - d\theta arm2);$$

$$WaveArm1 := \sin(d\theta arm1);$$

$$WaveArm2 := \sin(d\theta arm2);$$

$$LightIntensity := WaveArm1 + WaveArm2;$$

$$TimeDifference := \frac{Shift \cdot \lambda}{c};$$

$$dtEq := TimeDifference = dtArm1 - dtArm2;$$

$$FringeShift := evalf(solve(dtEq, Shift));$$

$$plot0 := plot(FringeShift, \theta = 0..2\pi, view = [0..2\pi, -5..5]);$$

$$plot1a := plot(LightIntensityEnvelope, \theta = 0..2\pi, view = [0..2\pi, -10..10]);$$

$$plot1b := plot(LightIntensityEnvelope, \theta = 0..2\pi, view = [0..2\pi, -10..10]);$$

$$plot2 := plot\left(LightIntensityEnvelope, \theta = 0..\frac{\pi}{2}, view = \left[0..\frac{\pi}{2}, -10..10\right]\right);$$

$$plot3 := plot\left(LightIntensityEnvelope, \theta = 260 \cdot \frac{\pi}{180}..360 \cdot \frac{\pi}{180}, view = \left[260 \cdot \frac{\pi}{180}..360 \cdot \frac{\pi}{180}, -10..10\right]\right);$$

$$plot4 := plot\left(FringeShift, \theta = 225 \cdot \frac{\pi}{180}..325 \cdot \frac{\pi}{180}, view = \left[225 \cdot \frac{\pi}{180}..325 \cdot \frac{\pi}{180}, -5..5\right]\right);$$

$$display([plot0]);$$

$$display([plot1a]);$$

$$display([plot1b]);$$

$$display([plot2]);$$

$$display([plot3]);$$

$$display([plot4]);$$

[*animate, animate3d, animatecurve, arrow, changecoords, complexplot, complexplot3d, conformal, conformal3d, contourplot, contourplot3d, coordplot, coordplot3d, densityplot, display, dualaxisplot, fieldplot, fieldplot3d, gradplot, gradplot3d, implicitplot, implicitplot3d, inequal, interactive, interactiveparams, intersectplot, listcontplot, listcontplot3d, listdensityplot, listplot, listplot3d, loglogplot, logplot, matrixplot, multiple, odeplot, pareto, plotcompare, pointplot, pointplot3d, polarplot, polygonplot, polygonplot3d, polyhedra_supported, polyhedraplot, rootlocus, semilogplot, setcolors, setoptions,*

$$setoptions3d, spacecurve, sparsematrixplot, surfdata, textplot, textplot3d, tubeplot]$$

$$Digits := 20$$

$$c := 299792458$$

$$\lambda := 0.000001310$$

$$NumberOfLoops := 15$$

$$BendRadius := 0.015$$

$$SingleLoopWidth := 0.030$$

$$SingleLoopLength := 0.304$$

$$TotalArmLength := 4.560$$

$$TotalArmWidth := 0.450$$

$$TotalFiberLengthPerArm := 10.533716694115406957$$

$$Altitude := \frac{23}{180}\ \pi$$

$$vWind := 420000$$

$$v := 3.8661203845002493750\ 10^{5}$$

$$n1 := 1.44915$$

$$n2 := 1.44975$$

$$n := 1.44975$$

$$\gamma := 1.0000008315337604908$$

$$cn := 2.0678907259872391792\ 10^{8}$$

$$FractionOfTimeLightIsHeldByMolecules := 0.31022590101741679600$$

$$TimeLightIsHeldByMolecules := 1.5002057656243933286\ 10^{-9}\ L$$

$$t0 := 4.8358454701352093386\ 10^{-9}\ L$$

$$L1 := \sqrt{L^2 + \left(3.8661203845002493750\ 10^{5}\ dtDiagonal - 0.00057999760914252705320\ L\right)^2}$$

$$Eqdt0 := dtDiagonal = 1.5002045181536888428\ 10^{-9}\ L + \frac{1}{299792458}\ \sqrt{L^2 + \left(3.8661203845002493750\ 10^{5}\ dtDiagonal - 0.00057999760914252705320\ L\right)^2}$$

$$\theta := \theta$$

$$unitXcomponent := \left|\cos(\theta)\right|^2$$

$$unitYcomponent := \left|\sin(\theta)\right|^2$$

$$TotalArmLengthA := 4.560\ \left|\cos(\theta)\right|^2$$

$$TotalArmWidthA := 0.450\ \left|\sin(\theta)\right|^2$$

$$TotalArmLengthB := 4.560\ \left|\sin(\theta)\right|^2$$

$$TotalArmWidthB := 0.450\ \left|\cos(\theta)\right|^2$$

$$L := 4.560\ \left|\cos(\theta)\right|^2$$

$$dtTotalArmLengthA := 2.2051467991870268162\ 10^{-8}\ \left|\cos(\theta)\right|^2$$

$$L := 0.450\,|\sin(\theta)|^2$$

$$dtTotalArmWidthA := 2.1761317097240396213\ 10^{-9}\,|\sin(\theta)|^2$$

$$L := 4.560\,|\sin(\theta)|^2$$

$$dtTotalArmLengthB := 2.2051467991870268162\ 10^{-8}\,|\sin(\theta)|^2$$

$$L := 0.450\,|\cos(\theta)|^2$$

$$dtTotalArmWidthB := 2.1761317097240396213\ 10^{-9}\,|\cos(\theta)|^2$$

$$dtPerpendicularArm1 := 4.4102935983740536324\ 10^{-8}\,|\cos(\theta)|^2 + 4.3522634194480792426\ 10^{-9}\,|\sin(\theta)|^2$$

$$dtPerpendicularArm2 := 4.4102935983740536324\ 10^{-8}\,|\sin(\theta)|^2 + 4.3522634194480792426\ 10^{-9}\,|\cos(\theta)|^2$$

$$L := L$$

$$TotalArmLengthContractedA := 4.5599962082092051640\,|\sin(\theta)|^2$$

$$TotalArmWidthContractedA := 0.44999962581011893066\,|\cos(\theta)|^2$$

$$TotalArmLengthContractedB := 4.5599962082092051640\,|\cos(\theta)|^2$$

$$TotalArmWidthContractedB := 0.44999962581011893066\,|\sin(\theta)|^2$$

$$dtParallelArm1 := 4.4102947360692281848\ 10^{-8}\,|\sin(\theta)|^2 + 4.3522645421735804455\ 10^{-9}\,|\cos(\theta)|^2$$

$$dtParallelArm2 := 4.4102947360692281848\ 10^{-8}\,|\cos(\theta)|^2 + 4.3522645421735804455\ 10^{-9}\,|\sin(\theta)|^2$$

$$dtArm1 := 4.8455200525914116770\ 10^{-8}\,|\cos(\theta)|^2 + 4.8455210780140361091\ 10^{-8}\,|\sin(\theta)|^2$$

$$dtArm2 := 4.8455200525914116770\ 10^{-8}\,|\sin(\theta)|^2 + 4.8455210780140361091\ 10^{-8}\,|\cos(\theta)|^2$$

$$dxArm1 := 14.526503668546685763\,|\cos(\theta)|^2 + 14.526506742686376436\,|\sin(\theta)|^2$$

$$dxArm2 := 14.526503668546685763\,|\sin(\theta)|^2 + 14.526506742686376436\,|\cos(\theta)|^2$$

$$d\theta arm1 := 1.5267175572519083969\ 10^{6}\,(14.526503668546685763\,|\cos(\theta)|^2 + 14.526506742686376436\,|\sin(\theta)|^2)\,\pi$$

$$d\theta arm2 := 1.5267175572519083969\ 10^{6}\,(14.526503668546685763\,|\sin(\theta)|^2 + 14.526506742686376436\,|\cos(\theta)|^2)\,\pi$$

$$LightIntensityEnvelope := -2\sin(-1.5267175572519083969\ 10^{6}\,(14.526503668546685763\,|\cos(\theta)|^2 + 14.526506742686376436\,|\sin(\theta)|^2)\,\pi + 1.5267175572519083969\ 10^{6}\,(14.526503668546685763\,|\sin(\theta)|^2$$

$$+ 14.526506742686376436\,|\cos(\theta)|^2)\,\pi)$$

$$WaveArm1 := \sin(1.5267175572519083969\ 10^6\,(14.526503668546685763\,|\cos(\theta)|^2 + 14.526506742686376436\,|\sin(\theta)|^2)\,\pi)$$

$$WaveArm2 := \sin(1.5267175572519083969\ 10^6\,(14.526503668546685763\,|\sin(\theta)|^2 + 14.526506742686376436\,|\cos(\theta)|^2)\,\pi)$$

$$LightIntensity := \sin(1.5267175572519083969\ 10^6\,(14.526503668546685763\,|\cos(\theta)|^2 + 14.526506742686376436\,|\sin(\theta)|^2)\,\pi) + \sin(1.5267175572519083969\ 10^6\,(14.526503668546685763\,|\sin(\theta)|^2 + 14.526506742686376436\,|\cos(\theta)|^2)\,\pi)$$

$$TimeDifference := 4.3696896470957918494\ 10^{-15}\ Shift$$

$$dtEq := 4.3696896470957918494\ 10^{-15}\ Shift = -1.0254226244321\ 10^{-14}\,|\cos(\theta)|^2 + 1.0254226244321\ 10^{-14}\,|\sin(\theta)|^2$$

$$FringeShift := -2.3466715195977871229\,|\cos(\theta)|^2 + 2.3466715195977871229\,|\sin(\theta)|^2$$

$$plot0 := PLOT(\ldots)$$

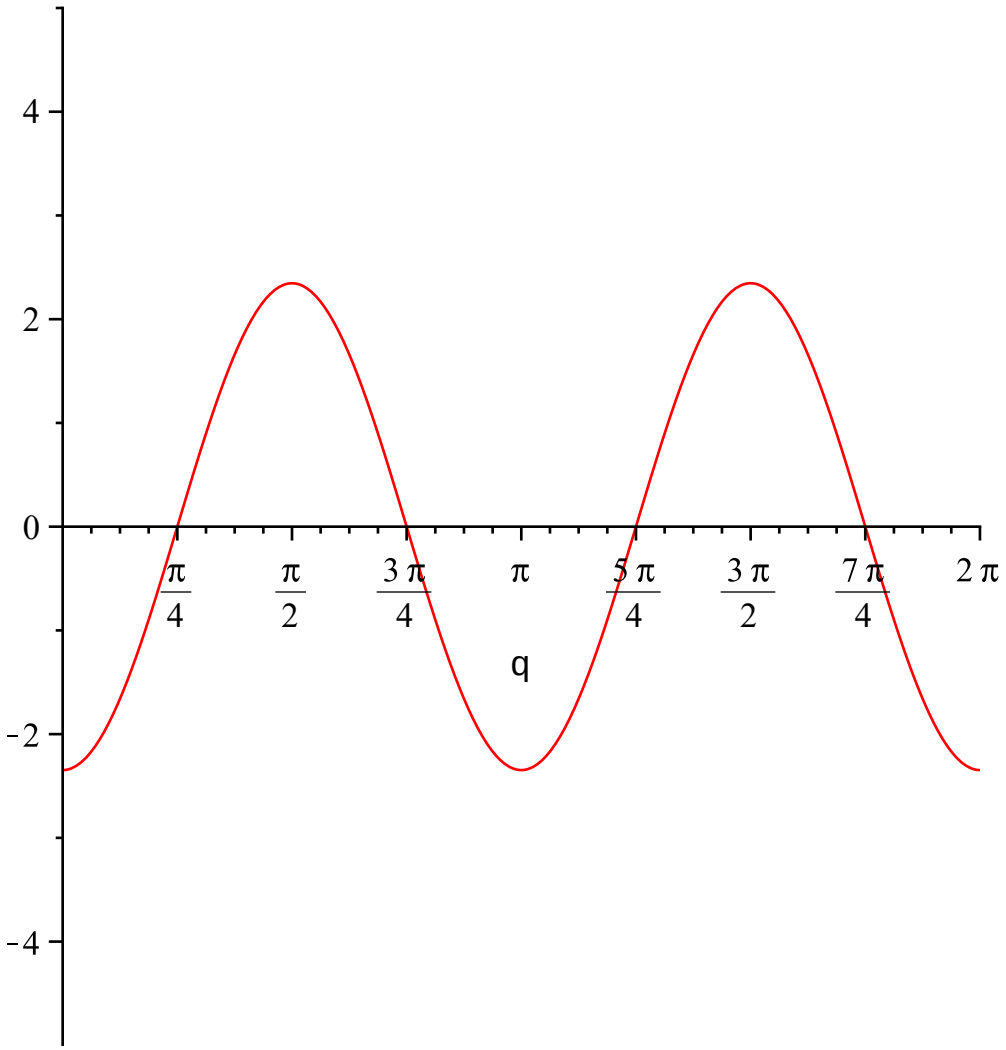
$$plot1a := PLOT(\ldots)$$

$$plot1b := PLOT(\ldots)$$

$$plot2 := PLOT(\ldots)$$

$$plot3 := PLOT(\ldots)$$

$$plot4 := PLOT(\ldots)$$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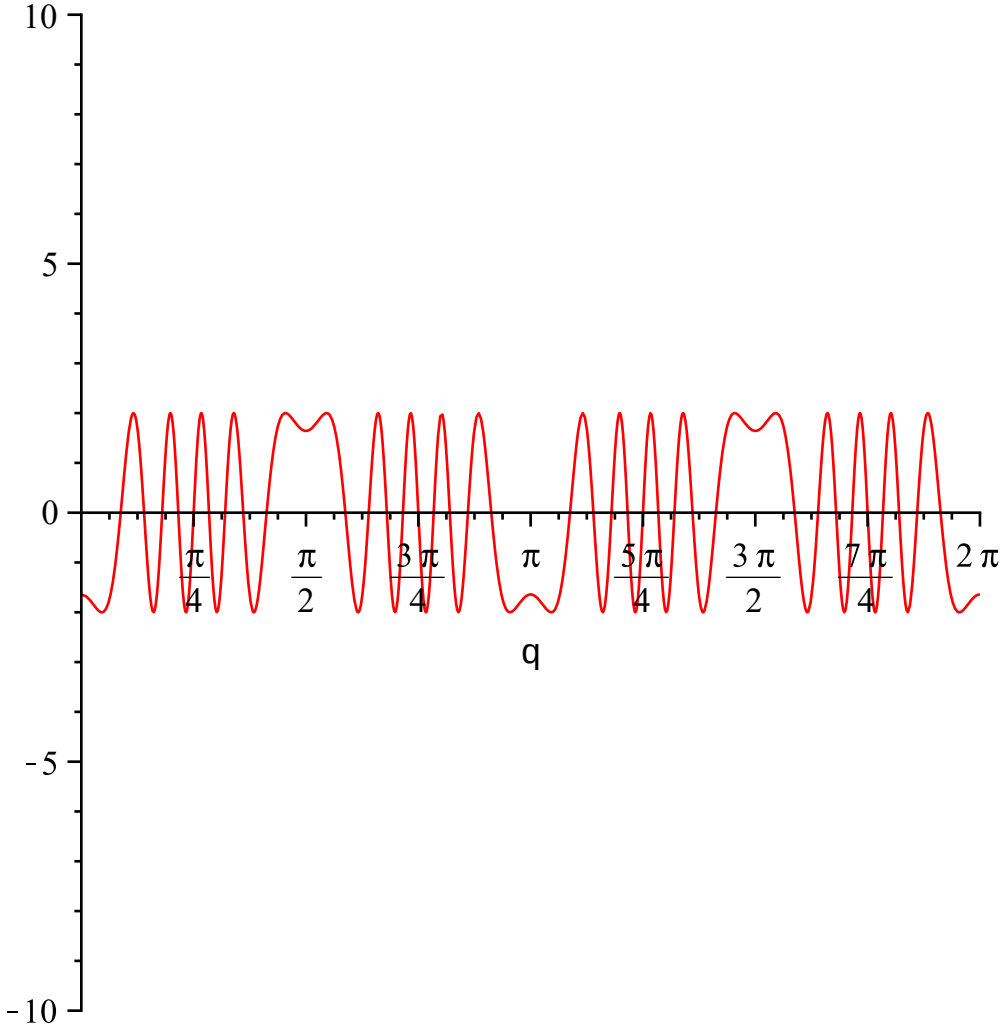
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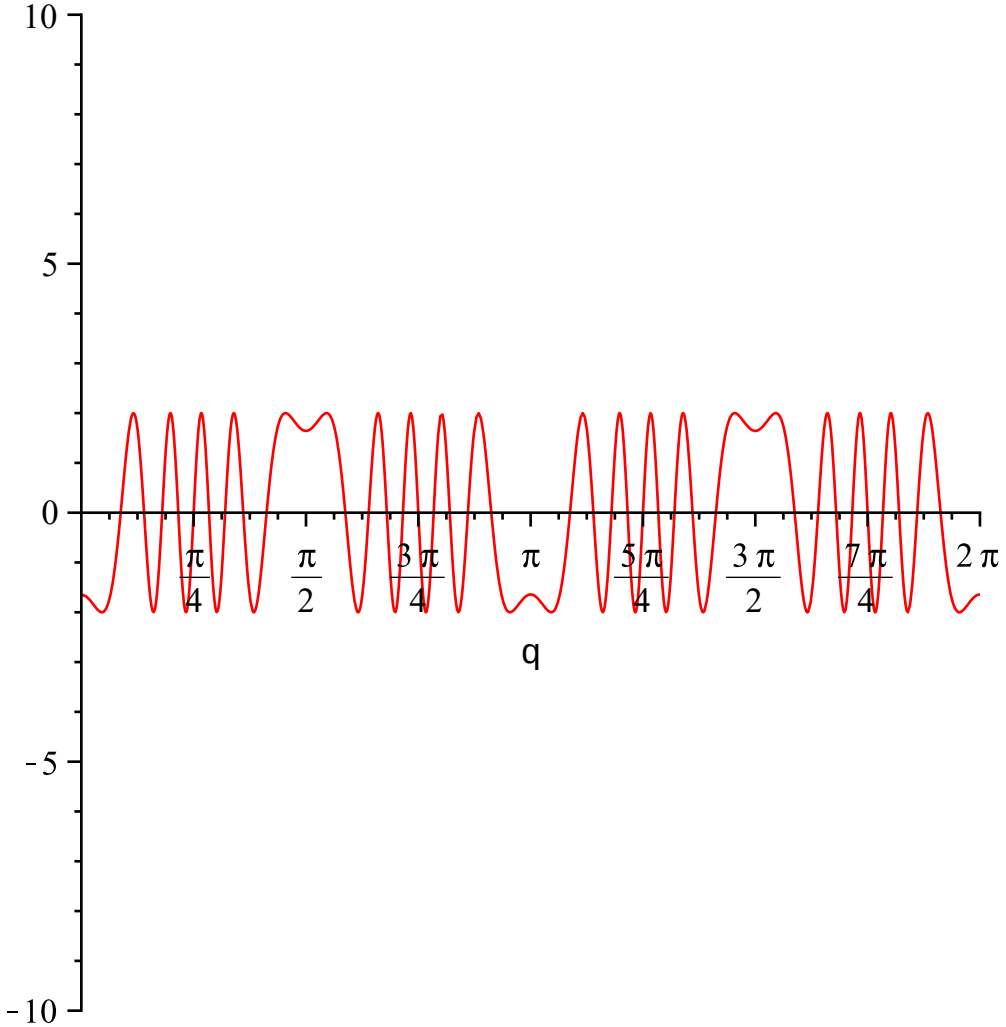
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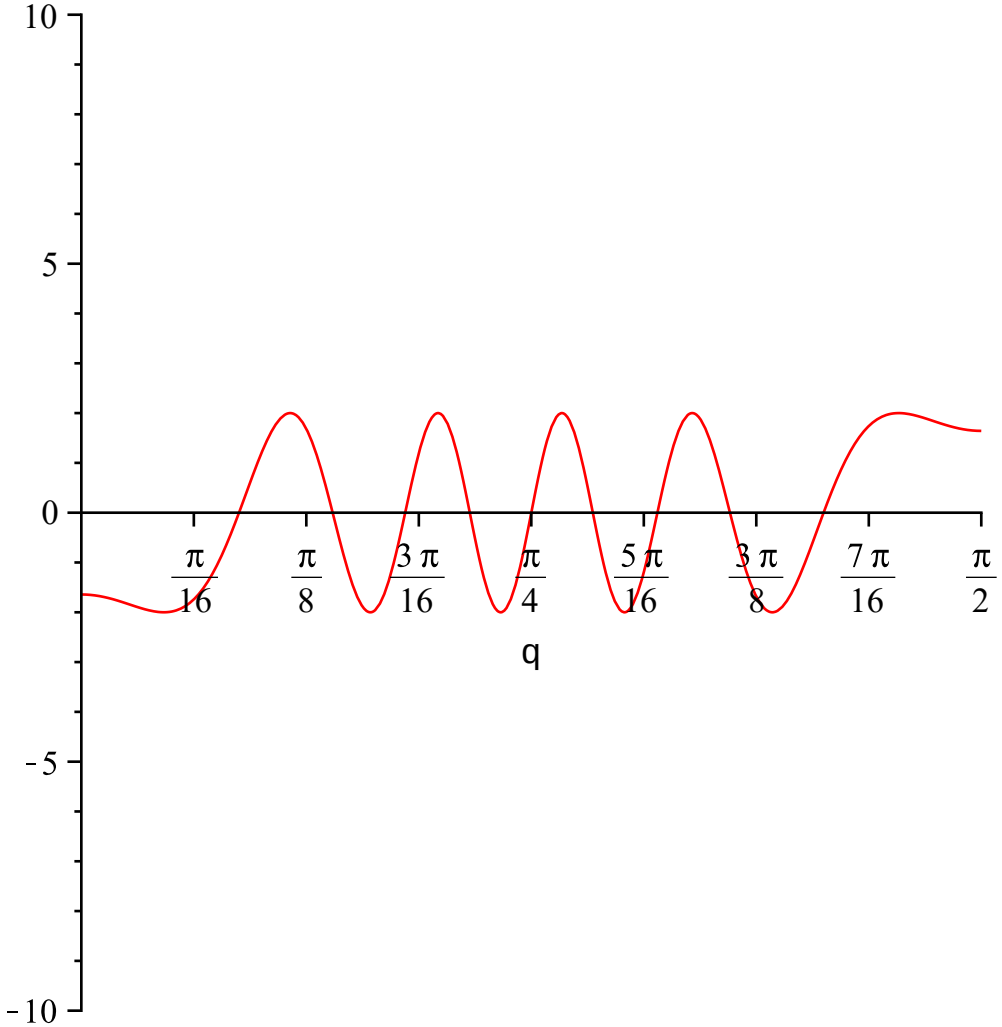
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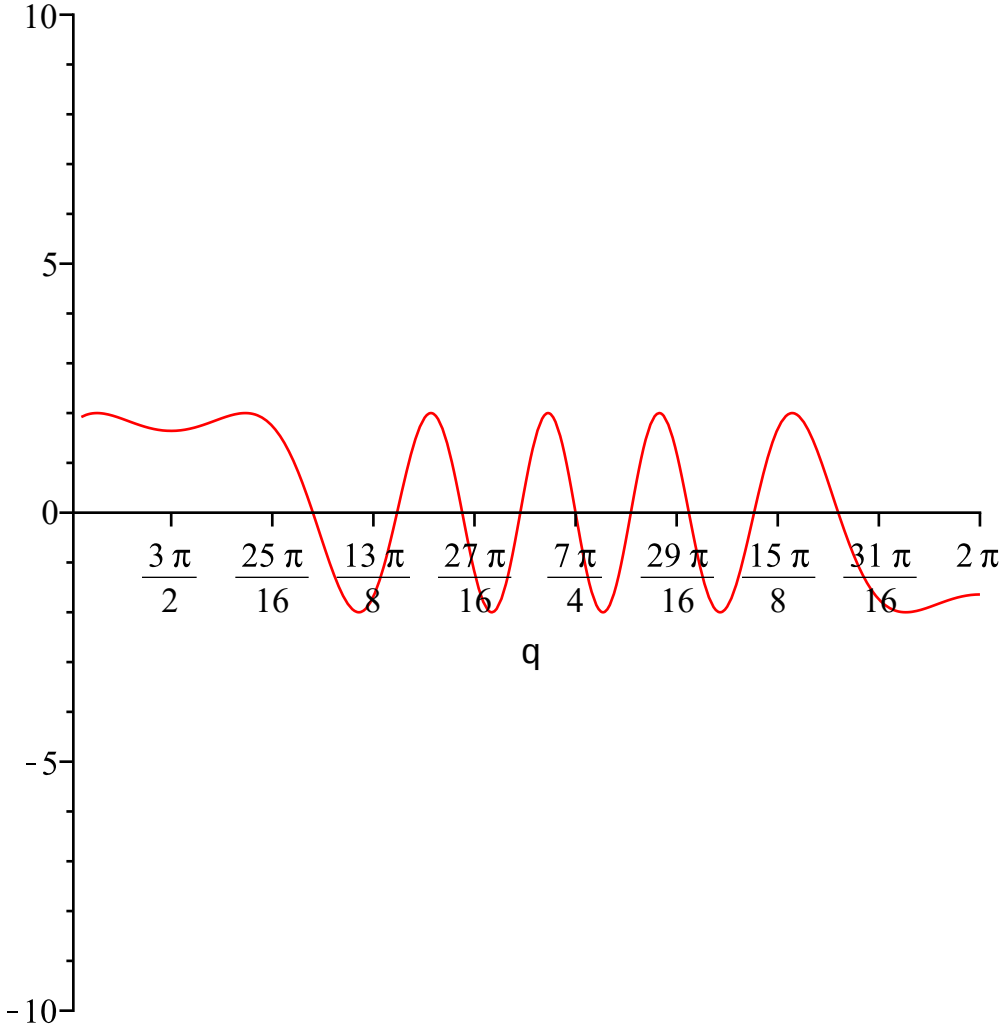
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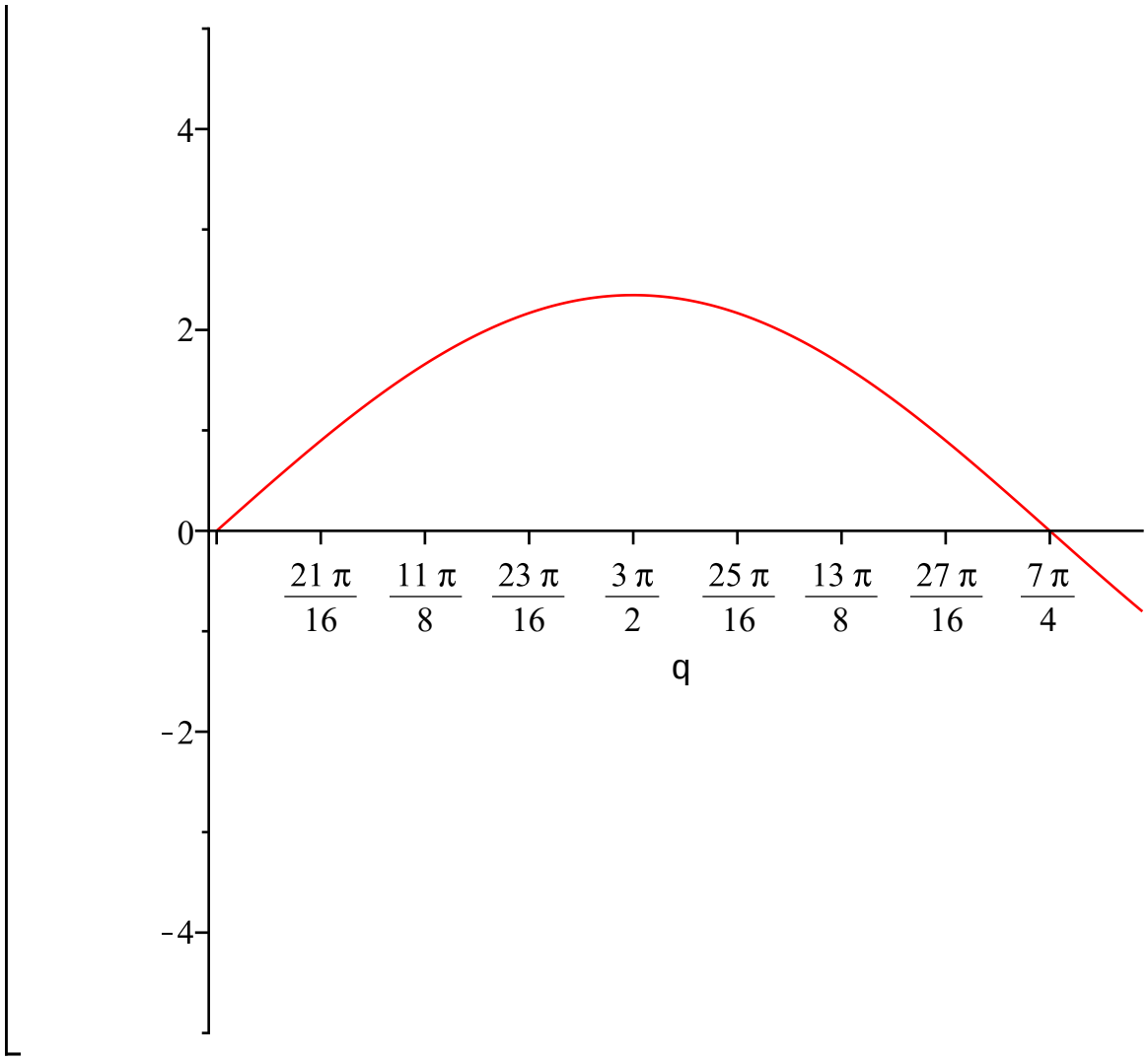
27 π / 16
7 π / 4
29 π / 16
15 π / 8
31 π / 16
2 π
q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21 π / 16
11 π / 8
23 π / 16
3 π / 2
25 π / 16
13 π / 8
27 π / 16
7 π / 4
q