



Frequency of Free Damped Vibrations Formulas

Calculators!

Examples!

Conversions!

Bookmark calculatoratoz.com, unitsconverters.com

Widest Coverage of Calculators and Growing - 30,000+ Calculators!

Calculate With a Different Unit for Each Variable - In built Unit Conversion!

Widest Collection of Measurements and Units - 250+ Measurements!

Feel free to SHARE this document with your friends!

Please leave your feedback here...

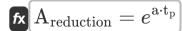




List of 19 Frequency of Free Damped Vibrations Formulas

Frequency of Free Damped Vibrations &

1) Amplitude Reduction Factor



Open Calculator 🗗

$$ex$$
 $1.822119 = e^{0.2 \text{Hz} \cdot 3 \text{s}}$

2) Condition for Critical Damping

$$\left|\mathbf{f}\mathbf{k}
ight| \mathrm{c_c} = 2\cdot\mathrm{m}\cdot\sqrt{rac{\mathrm{k}}{\mathrm{m}}}$$

Open Calculator

ex
$$17.32051 \mathrm{Ns/m} = 2 \cdot 1.25 \mathrm{kg} \cdot \sqrt{\frac{60 \mathrm{N/m}}{1.25 \mathrm{kg}}}$$

3) Critical Damping Coefficient

fx
$$\left[\mathbf{c_c} = 2 \cdot \mathbf{m} \cdot \mathbf{\omega_n}
ight]$$

Open Calculator



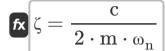
4) Damping Factor

$$\zeta = \frac{c}{c_c}$$

Open Calculator

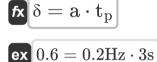
$$\boxed{\textbf{ex}} \ 0.1 = \frac{0.8 \text{Ns/m}}{8 \text{Ns/m}}$$

5) Damping Factor given Natural Frequency

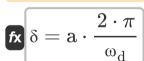


Open Calculator

6) Logarithmic Decrement



Open Calculator 🗗



7) Logarithmic Decrement using Circular Damped Frequency

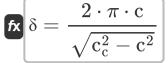
Open Calculator

$$\boxed{\textbf{ex} \ 0.20944 = 0.2 \text{Hz} \cdot \frac{2 \cdot \pi}{6}}$$





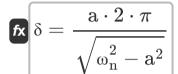
8) Logarithmic Decrement using Circular Damping Coefficient



Open Calculator 🗗

ex
$$0.631484 = \frac{2 \cdot \pi \cdot 0.8 \text{Ns/m}}{\sqrt{(8 \text{Ns/m})^2 - (0.8 \text{Ns/m})^2}}$$

9) Logarithmic Decrement using Natural Frequency



Open Calculator

$$0.059843 = \frac{0.2 \text{Hz} \cdot 2 \cdot \pi}{\sqrt{(21 \text{rad/s})^2 - (0.2 \text{Hz})^2}}$$

Under Damping 🗗

10) Circular Damped Frequency

$$\omega_{
m d} = \sqrt{rac{
m k}{
m m} - \left(rac{
m c}{2 \cdot
m m}
ight)^2}$$

Open Calculator 🗗

$$ext{ex} \left[6.920809 = \sqrt{rac{60 ext{N/m}}{1.25 ext{kg}} - \left(rac{0.8 ext{Ns/m}}{2 \cdot 1.25 ext{kg}}
ight)^2}
ight]$$





11) Circular Damped Frequency given Natural Frequency 🗗

 $\left|\omega_{
m d}
ight|\omega_{
m d}=\sqrt{\omega_{
m n}^2-a^2}$

Open Calculator 🚰

 $extbf{ex} 20.99905 = \sqrt{\left(21 ext{rad/s}
ight)^2 - \left(0.2 ext{Hz}
ight)^2}$

V (22233/3) (03222)

12) Displacement of Mass from Mean Position

fx $d_{
m mass} = A \cdot \cos(\omega_{
m d} \cdot t_{
m p})$

Open Calculator

13) Frequency Constant for Damped Vibrations

 $a = \frac{c}{m}$

Open Calculator 🖸

 $oxed{ex} 0.64 ext{Hz} = rac{0.8 ext{Ns/m}}{1.25 ext{kg}}$

14) Frequency Constant for Damped Vibrations given Circular Frequency

 $\mathbf{x} = \sqrt{\omega_{
m n}^2 - \omega_{
m d}^2}$

Open Calculator

 $extbf{ex} 20.12461 ext{Hz} = \sqrt{\left(21 ext{rad/s}
ight)^2 - \left(6
ight)^2}$



15) Frequency of Damped Vibration

 $\mathbf{f} = \frac{1}{2 \cdot \pi} \cdot \sqrt{\frac{k}{m} - \left(\frac{c}{2 \cdot m}\right)^2}$

Open Calculator 🗗

 $ext{ex} \ 1.101481 ext{Hz} = rac{1}{2 \cdot \pi} \cdot \sqrt{rac{60 ext{N/m}}{1.25 ext{kg}} - \left(rac{0.8 ext{Ns/m}}{2 \cdot 1.25 ext{kg}}
ight)^2}$

16) Frequency of Damped Vibration using Natural Frequency

 $\mathbf{f} \mathbf{x} = rac{1}{2 \cdot \pi} \cdot \sqrt{\omega_{\mathrm{n}}^2 - \mathrm{a}^2}$

Open Calculator

 $oxed{\mathbf{ex}} \left[3.342102 \mathrm{Hz} = rac{1}{2 \cdot \pi} \cdot \sqrt{(21 \mathrm{rad/s})^2 - (0.2 \mathrm{Hz})^2}
ight]$

17) Frequency of Undamped Vibration

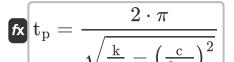
 $\mathbf{f} = rac{1}{2 \cdot \pi} \cdot \sqrt{rac{\mathrm{k}}{\mathrm{m}}}$

Open Calculator

 $oxed{\mathbf{ex}} 1.102658 \mathrm{Hz} = rac{1}{2 \cdot \pi} \cdot \sqrt{rac{60 \mathrm{N/m}}{1.25 \mathrm{kg}}}$



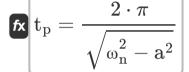
18) Periodic Time of Vibration



Open Calculator

$$ex 0.907869s = \frac{2 \cdot \pi}{\sqrt{\frac{60 \text{N/m}}{1.25 \text{kg}} - \left(\frac{0.8 \text{Ns/m}}{2 \cdot 1.25 \text{kg}}\right)^2} }$$

19) Periodic Time of Vibration using Natural Frequency



Open Calculator

ex
$$0.299213s = \frac{2 \cdot \pi}{\sqrt{(21 \text{rad/s})^2 - (0.2 \text{Hz})^2}}$$



Variables Used

- a Frequency Constant for Calculation (Hertz)
- A Amplitude of Vibration (Millimeter)
- Areduction Amplitude Reduction Factor
- C Damping Coefficient (Newton Second per Meter)
- Cc Critical Damping Coefficient (Newton Second per Meter)
- d_{mass} Total Displacement (Millimeter)
- **f** Frequency (Hertz)
- **k** Stiffness of Spring (Newton per Meter)
- **m** Mass Suspended from Spring (Kilogram)
- t_p Time Period (Second)
- δ Logarithmic Decrement
- ζ Damping Ratio
- ω_d Circular Damped Frequency
- ω_n Natural Circular Frequency (Radian per Second)





Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288
 Archimedes' constant
- Constant: e, 2.71828182845904523536028747135266249
 Napier's constant
- Function: cos, cos(Angle)
 Trigonometric cosine function
- Function: sqrt, sqrt(Number)
 Square root function
- Measurement: Length in Millimeter (mm)
 Length Unit Conversion
- Measurement: Weight in Kilogram (kg)
 Weight Unit Conversion
- Measurement: Time in Second (s)
 Time Unit Conversion
- Measurement: Frequency in Hertz (Hz)
 Frequency Unit Conversion
- Measurement: Surface Tension in Newton per Meter (N/m)
 Surface Tension Unit Conversion
- Measurement: Angular Velocity in Radian per Second (rad/s)

 Angular Velocity Unit Conversion
- Measurement: Damping Coefficient in Newton Second per Meter (Ns/m)
 Damping Coefficient Unit Conversion





Check other formula lists

- Load for Various Types of Beams and Load Conditions Formulas
- Critical or Whirling Speed of Shaft
 Formulas
- Effect of Inertia of Constraint in Longitudinal and Transverse
 Vibrations Formulas
- Frequency of Free Damped Vibrations Formulas
- Frequency of Under Damped
 Forced Vibrations Formulas
- Magnification Factor or Dynamic
 Magnifier Formulas
- Natural Frequency of Free Transverse Vibrations
 Formulas
- Natural Frequency of Free Transverse Vibrations Due to Uniformly Distributed Load

- Acting Over a Simply Supported
 Shaft Formulas

 Natural Frequency of Free
 Transverse Vibrations For a Shaft
 Subjected to a Number of Point
 Loads Formulas
- Natural Frequency of Free
 Transverse Vibrations of a Shaft
 Fixed at Both Ends Carrying a
 Uniformly Distributed Load
 Formulas
- Values of length of beam for the various types of beams and under various load conditions
 Formulas
- Values of static deflection for the various types of beams and under various load conditions
 Formulas
- Vibration Isolation and Transmissibility Formulas

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch





12/1/2023 | 10:12:48 PM UTC

Please leave your feedback here...



