## Important Linear Dispersion Relation of Linear Wave Formulas PDF



Formulas Examples with Units

#### List of 12

Important Linear Dispersion Relation of Linear Wave Formulas

#### 1) Angular Frequency of Wave Formula 🕝



$$o_{c} = \sqrt{[g] \cdot k \cdot \tanh(k \cdot d)}$$

Example with Units

$$1.3751_{\text{rad/s}} = \sqrt{9.8066_{\text{m/s}^2} \cdot 0.2 \cdot \tanh(0.2 \cdot 10_{\text{m}})}$$

#### 2) Dimensionless Wave Speed Formula 🕝

Formula

$$v = \frac{v_{p'}}{\sqrt{[g] \cdot d}}$$

**Example with Units** 

$$50.0058\,\text{m/s} = \frac{495.2\,\text{m/s}}{\sqrt{9.8066\,\text{m/s}^2 \cdot 10\,\text{m}}}$$

3) Guo Formula of Linear Dispersion Relation Formula 🗂

Formula



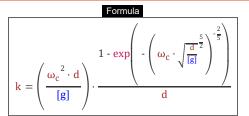
Evaluate Formula (

Evaluate Formula [7]

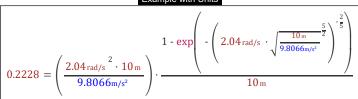
$$\mathbf{kd} = \left(\omega^2 \cdot \frac{\mathbf{d}}{[\mathbf{g}]}\right) \cdot \left(1 - \exp\left(-\left(\omega \cdot \sqrt{\frac{\mathbf{d}}{[\mathbf{g}]}}\right)^{\frac{5}{5}}\right)\right)$$

$$14.8776 = \left(6.2 \, \text{rad/s}^{2} \cdot \frac{10 \, \text{m}}{9.8066 \, \text{m/s}^{2}}\right) \cdot \left(1 - \exp\left(-\left(6.2 \, \text{rad/s}^{2} \cdot \sqrt{\frac{10 \, \text{m}}{9.8066 \, \text{m/s}^{2}}}\right)^{\frac{5}{2}}\right)\right)$$

#### 4) Guo Formula of Linear Dispersion Relation for Wave Number Formula 🕝



#### Example with Units



#### 5) Radian Frequency of Waves Formula



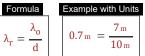


### Evaluate Formula (

Evaluate Formula (

#### 6) Relative Wavelength Formula 🕝





Evaluate Formula

#### 7) Velocity of Propagation in Linear Dispersion Relation Formula 🕝



$$= \sqrt{\frac{[g] \cdot d \cdot \tanh(k \cdot d)}{k \cdot d}}$$

Formula Example with Units 
$$C_v = \sqrt{\frac{[g] \cdot d \cdot tanh\left(k \cdot d\right)}{k \cdot d}} \quad \boxed{ 6.8753 \, \text{m/s} } = \sqrt{\frac{9.8066 \, \text{m/s}^2 \cdot 10 \, \text{m} \cdot tanh\left(0.2 \cdot 10 \, \text{m}\right)}{0.2 \cdot 10 \, \text{m}}}$$



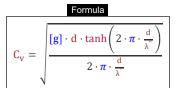
#### 8) Velocity of Propagation in Linear Dispersion Relation given Wavelength Formula

Evaluate Formula

Evaluate Formula (

Evaluate Formula (

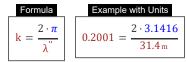
Evaluate Formula 🕝



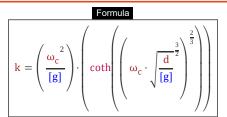
Example with Units

$$6.8738 \,\text{m/s} = \sqrt{\frac{9.8066 \,\text{m/s}^2 \cdot 10 \,\text{m} \cdot \tanh\left(2 \cdot 3.1416 \cdot \frac{10 \,\text{m}}{31.4 \,\text{m}}\right)}{2 \cdot 3.1416 \cdot \frac{10 \,\text{m}}{31.4 \,\text{m}}}}$$

#### 9) Wave Number for Steady Two-dimensional Waves Formula 🗂

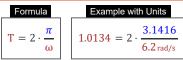


#### 10) Wave Number of Convenient Empirical Explicit Approximation Formula



$$0.4587 = \left(\frac{2.04_{\text{rad/s}}^{2}}{9.8066_{\text{m/s}^{2}}}\right) \cdot \left(\coth\left(\frac{2.04_{\text{rad/s}} \cdot \sqrt{\frac{10_{\text{m}}}{9.8066_{\text{m/s}^{2}}}}}{\frac{3}{2}}\right)^{\frac{2}{3}}\right)$$

#### 11) Wave Period given Radian Frequency of Waves Formula 🗂



#### 12) Wavelength given Wave Number Formula 🗂



Formula

$$31.4159 \,\mathrm{m} = \frac{2 \cdot 3.1416}{0.2}$$

## Variables used in list of Linear Dispersion Relation of Linear Wave Formulas above

- C<sub>v</sub> Velocity of Propagation (Meter per Second)
- d Coastal Mean Depth (Meter)
- k Wave Number for Water Wave
- kd Linear Dispersion Relation
- T Wave Period
- V Wave Speed (Meter per Second)
- V<sub>p</sub>· Propagation Velocity (Meter per Second)
- λ<sub>O</sub> Deep-Water Wavelength (Meter)
- λ<sub>r</sub> Relative Wavelength (Meter)
- λ" Deep Water Wavelength of Coast (Meter)
- ω Wave Angular Frequency (Radian per Second)
- ω<sub>c</sub> Angular Frequency of Wave (Radian per Second)

# Constants, Functions, Measurements used in list of Linear Dispersion Relation of Linear Wave Formulas above

- constant(s): pi,
   3.14159265358979323846264338327950288
   Archimedes' constant
- constant(s): [g], 9.80665 Gravitational acceleration on Earth
- Functions: coth, coth(Number)
   The hyperbolic cotangent function, denoted as coth(x), is defined as the ratio of the hyperbolic cosine to the hyperbolic sine.
- Functions: exp, exp(Number)

   n an exponential function, the value of the function changes by a constant factor for every unit change in the independent variable.
- Functions: sqrt, sqrt(Number)
   A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Functions: tanh, tanh(Number)
   The hyperbolic tangent function (tanh) is a function that is defined as the ratio of the hyperbolic sine function (sinh) to the hyperbolic cosine function (cosh).
- Measurement: Length in Meter (m)
  Length Unit Conversion
- Measurement: Speed in Meter per Second (m/s)
   Speed Unit Conversion
- Measurement: Angular Frequency in Radian per Second (rad/s)

Angular Frequency Unit Conversion

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