Graphical Transformations of Points

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| --- | --- | --- |
| f ( x ) = x2 – 12 x + 43 | | |
| Coordinate  ( 6 , 7 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = 4 f ( x ) | y = f ( 3 x ) |
| y = 4 ( x2 – 12 x + 43 ) |  |
|  | ( 2 , 7 ) |
| Translation | y = f ( x ) – 4 | y = f ( x + 3 ) |
|  | y = ( x + 3 )2 – 12 ( x + 3 ) + 43 |
| ( 6 , 3 ) |  |

|  |  |  |
| --- | --- | --- |
| f ( x ) = sin ( x ) | | |
| Coordinate  ( 90 , 1 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = 5 f ( x ) | y = f ( 2 x ) |
|  | y = sin ( 2 x ) |
|  |  |
| Translation | y = f ( x ) + 7 | y = f ( x - 90 ) |
|  |  |
|  | ( 180 , 1 ) |

|  |  |  |
| --- | --- | --- |
| f ( x ) = x3 + 3 x2 – 5 | | |
| Coordinate  ( -2 , -1 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = 3 f ( x ) | y = f ( 2 x ) |
|  |  |
|  |  |
| Translation | y = f ( x ) + 2 | y = f ( x + 6 ) |
|  |  |
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| --- | --- | --- |
| f ( x ) = cos ( x ) | | |
| Coordinate  (270 , -1 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = ½ f ( x ) | y = f ( -x ) |
|  |  |
|  |  |
| Translation | y = f ( x ) - 2 | y = f ( x + 180 ) |
|  |  |
|  |  |

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| --- | --- | --- |
| f ( x ) = 4 x – 7 – x2 | | |
| Coordinate  ( 2 , -3 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = -3 f ( x ) | y = f ( 2 x ) |
|  |  |
|  |  |
| Translation | y = f ( x ) + 3 | y = f ( x - 2 ) |
|  |  |
|  |  |

|  |  |  |
| --- | --- | --- |
| f ( x ) = x2 + 10 x + 31 | | |
| Coordinate  ( -5 , 6 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement |  |  |
|  | y = (x )2 + 10 ( x ) + 31 |
| ( -5 , 24 ) |  |
| Translation | y = f ( x ) + \_\_ | y = f ( x + \_\_ ) |
| y = ( x2 + 10 x + 31 ) + \_\_ | y = ( x + \_\_ )2 + 10 ( x + \_\_ ) + 31 |
| ( -5 , 12 ) | ( -7 , 6 ) |

|  |  |  |
| --- | --- | --- |
| f ( x ) | | |
| Coordinate  ( x , y ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = a f ( x ) | y = f ( b x ) |
| y = a f ( x ) | y = f ( b x ) |
|  |  |
| Translation | y = f ( x ) + c | y = f ( x + d ) |
| y = f ( x ) + c | y = f ( x + d ) |
|  |  |

|  |  |  |
| --- | --- | --- |
| f ( x ) | | |
| Coordinate  ( x , y ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = f ( x ) | y = f ( x ) |
| y = f ( x ) | y = f ( b x ) |
|  |  |
| Translation | y = f ( x ) - c | y = f ( x - d ) |
| y = f ( x ) - c | y = f ( x - d ) |
|  |  |

Graphical Transformations of Points (Solutions)

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| --- | --- | --- |
| f ( x ) = x2 – 12 x + 43 | | |
| Coordinate  ( 6 , 7 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = 4 f ( x ) | y = f ( 3 x ) |
| y = 4 ( x2 – 12 x + 43 ) | y = ( 3 x )2 – 12 ( 3 x ) + 43 |
| ( 6 , 28 ) | ( 2 , 7 ) |
| Translation | y = f ( x ) – 4 | y = f ( x + 3 ) |
| y = ( x2 – 12 x + 43 ) – 4 | y = ( x + 3 )2 – 12 ( x + 3 ) + 43 |
| ( 6 , 3 ) | ( 3 , 7 ) |

|  |  |  |
| --- | --- | --- |
| f ( x ) = sin ( x ) | | |
| Coordinate  ( 90 , 1 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = 5 f ( x ) | y = f ( 2 x ) |
| y = 5 ( sin ( x ) ) | y = sin ( 2 x ) |
| ( 90 , 5 ) | ( 45 , 1 ) |
| Translation | y = f ( x ) + 7 | y = f ( x - 90 ) |
| y = ( sin (x) ) + 7 | y = sin ( x - 90 ) |
| ( 90 , 8 ) | ( 180 , 1 ) |

|  |  |  |
| --- | --- | --- |
| f ( x ) = x3 + 3 x2 – 5 | | |
| Coordinate  ( -2 , -1 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = 3 f ( x ) | y = f ( 2 x ) |
| y = 3 ( x3 + 3 x2 – 5 ) | y = ( 2 x )3 + 3 ( 2 x )2 – 5 |
| ( -2 , -3 ) | ( -1 , -1 ) |
| Translation | y = f ( x ) + 2 | y = f ( x + 6 ) |
| y = ( x3 + 3 x2 – 5 ) + 2 | y = ( x + 6 )3 + 3 ( x + 6 )2 – 5 |
| ( -2 , 1 ) | ( -8 , -1 ) |

|  |  |  |
| --- | --- | --- |
| f ( x ) = cos ( x ) | | |
| Coordinate  (270 , -1 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = ½ f ( x ) | y = f ( -x ) |
| y = ½ ( cos ( x ) ) | y = cos ( -x ) |
| ( 270 , ½ ) | ( -270 , -1 ) |
| Translation | y = f ( x ) - 2 | y = f ( x + 180 ) |
| y = ( cos (x) ) - 2 | y = cos ( x + 180 ) |
| ( 270 , -3 ) | ( 90 , -1 ) |

|  |  |  |
| --- | --- | --- |
| f ( x ) = 4 x – 7 – x2 | | |
| Coordinate  ( 2 , -3 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = -3 f ( x ) | y = f ( 2 x ) |
| y = -3 ( 4 x – 7 – x2 ) | y = 4 ( 2 x ) – 7 – ( 2 x )2 |
| ( 2 , 9 ) | ( 1 , -3 ) |
| Translation | y = f ( x ) + 3 | y = f ( x - 2 ) |
| y = ( 4 x – 7 – x2 ) + 3 | y = 4 ( x – 2 ) – 7 – ( x – 2 )2 |
| ( 2 , 0 ) | ( 4 , -3 ) |

|  |  |  |
| --- | --- | --- |
| f ( x ) = x2 + 10 x + 31 | | |
| Coordinate  ( -5 , 6 ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = 4 f ( x ) | y = f ( x ) |
| y = 4 ( x2 + 10 x + 31 ) | y = (x )2 + 10 ( x ) + 31 |
| ( -5 , 24 ) | ( 15 , 6 ) |
| Translation | y = f ( x ) + \_\_ | y = f ( x + \_\_ ) |
| y = ( x2 + 10 x + 31 ) + \_\_ | y = ( x + \_\_ )2 + 10 ( x + \_\_ ) + 31 |
| ( -5 , 12 ) | ( -7 , 6 ) |

|  |  |  |
| --- | --- | --- |
| f ( x ) | | |
| Coordinate  ( x , y ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = a f ( x ) | y = f ( b x ) |
| y = a f ( x ) | y = f ( b x ) |
| ( x , b y ) | ( , y ) |
| Translation | y = f ( x ) + c | y = f ( x + d ) |
| y = f ( x ) + c | y = f ( x + d ) |
| ( x , y + c ) | ( x - d , y ) |

|  |  |  |
| --- | --- | --- |
| f ( x ) | | |
| Coordinate  ( x , y ) | Vertical Transformation | Horizontal Transformation |
| Enlargement | y = f ( x ) | y = f ( x ) |
| y = f ( x ) | y = f ( b x ) |
| ( x , ) | ( b x , y ) |
| Translation | y = f ( x ) - c | y = f ( x - d ) |
| y = f ( x ) - c | y = f ( x - d ) |
| ( x , y - c ) | ( x + d , y ) |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Co-Ordinate | 4 f ( x ) | f ( 3 x ) | f ( x ) + 6 | f ( x – 4 ) | -2 f ( x ) | f ( ½ x ) | f ( x ) - 7 | f ( x ) + 2 | 3 f ( x + 2 ) |
| ( 12 , -2 ) |  |  |  |  |  |  |  |  |  |
| ( 6 , 6 ) |  |  |  |  |  |  |  |  |  |
| ( -6 , 9 ) |  |  |  |  |  |  |  |  |  |
| ( - 3 , - 2 ) |  |  |  |  |  |  |  |  |  |
| ( 15 , 10 ) |  |  |  |  |  |  |  |  |  |
| ( 0 , 0) |  |  |  |  |  |  |  |  |  |
| ( x , y ) |  |  |  |  |  |  |  |  |  |

**Graphical Transformation Grid**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Co-Ordinate | 2 f ( 3 x ) | f ( ½ x ) + 2 | 5 f ( x ) - 6 | 3 f ( x – 4 ) | 5 f ( -3 x ) | -2 f ( ½ x ) +8 | 6 f ( x - 8 ) - 7 | 5 f ( 2 x ) + 9 | 4 f ( x - 1 ) +1 |
| ( 12 , -2 ) |  |  |  |  |  |  |  |  |  |
| ( 6 , 6 ) |  |  |  |  |  |  |  |  |  |
| ( -6 , 9 ) |  |  |  |  |  |  |  |  |  |
| ( - 3 , - 2 ) |  |  |  |  |  |  |  |  |  |
| ( 15 , 10 ) |  |  |  |  |  |  |  |  |  |
| ( 3 , 8) |  |  |  |  |  |  |  |  |  |
| ( x , y ) |  |  |  |  |  |  |  |  |  |