Application of Rates of Change

# Curvature

The curvature (κ) of a function is a measure of the degree to which it deviates from being straight. The tighter the curve or the more sharply that it bends, the greater the curvature. Curve A below has a higher curvature than Curve B. The units of curvature are *length-1* (i.e. m-1, cm-1).

Curve B

Curve A

The ultimate example of curvature is the circle, which has a curvature of . The curvature is the same at all points around the circle. For other curves the curvature represents the circle of radius *r* that would create the same bend at that point.

At this point the curvature of the circle is equal to that of the curve:

*r*

The curvature of a straight line is zero, it has no curve.

The curvature at any point along the curve, *y*, is given by the equation:

where *y’* is the derivative and *y”* the derivative of *y’*.

1. **Determine the curvature of the functions and at . Which function has the tightest curve from ?**
2. **Find three physical objects or structures with a curve in them. Include an image of each in your submission. Develop suitable equations for each object. Determine the maximum curvature of each of the objects and the point at which it occurs.**