

1. The motion of a spring that is subject to a frictional force or damping force (such as shock absorber in a car) is often modeled by the product of an exponential function and a sine or cosine function. Suppose the equation of motion of a point on such a spring is

$$s(t) = 2e^{-1.5t} \sin(2\pi t)$$

where s is measured in centimeters and t in seconds. Find the velocity after t seconds.

2. Find the 70th derivative of $y = \cos(2x)$.
3. The equation $x^2 - xy + y^2 = 3$ represents a "rotated ellipse," that is, an ellipse whose axes are not parallel to the coordinate axes.
- (a) Find the points at which this ellipse crosses the x -axis.
- (b) Show that the tangent lines at these points are parallel.

4. Find all points on the curve $x^2y^2 + xy = 2$ where the slope of the tangent line is -1 .
5. Differentiate the following functions

(a) $y = \left[\ln(1 + e^{x^2}) \right]^2$

(b) $y = x^{\cos x}$

6. Given the curve $9x^2 + y^2 = 9$. Find y'' .
7. P. 149 #18
8. P. 149 #42

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