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Derivatives and Their Applications (2)

1. For each case, find the intervals of concavity and the points of inflection.

a. f(x) = $x^2 - 4x + 3$

b. f(x) = $(x^2 - 1)^3$

c. f(x) = $\begin{cases} 2x + 4, & x \leq -1 \\ 3 - x^2, & x > -1 \end{cases}$

d. f(x) = $e^x(x+1)$

e. f(x) = xlnx

f. f(x) = $\ln(1 + x^2)$

2. Determine the point of intersection of the tangent lines to the points of inflection of the curve f(x) = $x^4 - 6x^2 + 3$.

3. Find a function *f* such that *f'(x)* = $3x^2 - 6x + 3$ and (1, -2) is a point of inflection of the graph of f.

4. Ima Farmer has 60 orange trees in her grove and harvests an average of 400 oranges per tree in one season. She considers planting more trees but knows that the average yield per tree will be reduced by 4 oranges for each additional tree planted on the same acreage. How many trees should Ima have in her grove to maximize yield?

5. Find d given that (d, f (d)) is a point of inflection of the graph of f(x) = (x − a)(x − b)(x − c).

6. Show that the function f(x)=x|x| has an inflection point at (0, 0) but $f''(0)$ does not exist.

7. Find a and b given that the graph of $f(x) = ax^3 + bx^2$ passes through (-1, 1) and has a point of inflection at x = 1/3.

8. Find the inflection points, if any.

a. $f(x) = (x - a)^3$

b. $f(x) = (x - a)^4$

9. Determine a and b so that the curve $y = a\sqrt{x} + \frac{b}{\sqrt{x}}$ will have a point of inflection at (1, 4).