CALCULUS I – Worksheet #47

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1. (Free–response—show all work) A particle moves along a line so that its position s at time t is given by

$$s(t) = \int_0^t (3w^2 - 6w)\, dw .$$

a) Find its acceleration at any time t.
b) Determine the values of t for which the particle is moving in a positive direction.
c) Find the values of t for which the particle is slowing down.

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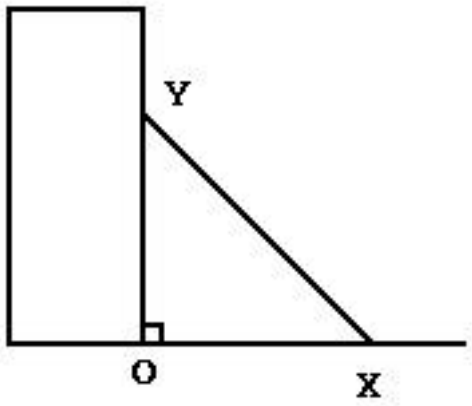
2. (Free–response—show all work) A ladder 15 feet long is leaning against a building so that end X is on level ground and an end Y is on the wall as shown in the figure below. X is moved away from the building at the constant rate of $\frac{1}{2}$ feet per second.

a) Find the rate in feet per second at which the length OY is changing when X is 9 feet from the building.
b) Find the rate of change in square feet per second of the area of the triangle XOY when X is 9 feet from the building.



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3. If $f(x) = xe^{-x}$, then at x = 0
A) f is increasing B) f is decreasing C) f has a relative minimum
D) f has a relative maximum E) f ' does not exist

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4. If $f(x) = ax^4 + bx^2$ and ab > 0, then
A) the curve has no horizontal tangents B) the curve is concave up for all x
C) the curve is concave down for all x D) the curve has no inflection point
E) none of the preceding is necessarily true

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5. At which point on the following graph do both $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ equal zero?

A) P B) Q C) R D) S E) T