

Applications of Derivatives

Mixed Review:

1. $\lim_{x \rightarrow 1} \frac{x^3 - x^2 - 3x + 3}{x - 1}$	2. $\frac{d}{dx} [6\sqrt{x^3} + 4]$	3. $\int (6\sqrt{x^3} + 4) dx$
4. $\lim_{x \rightarrow 0} \frac{3 - 3\cos x}{x}$	5. $\frac{d}{dx} [\sec^4(2x)]$	6. $\int_0^2 \frac{x^2}{(x^3 + 4)^2} dx$

Relative Extrema & Concavity

7.

The graph of $f(x)$ is pictured.
List all points (x_1 , x_2 , x_3 , x_4 , x_5 , or x_6) that satisfy the criterion:

a) $f'(x) = 0$

b) $f'(x)$ does not exist

c) a relative max.

d) a relative min.

e) $f'(x) > 0$

f) f is increasing

g) $f'(x) < 0$

h) f is decreasing

i) f concave up

j) $f''(x) > 0$

k) f concave down

l) $f''(x) < 0$

m) inflection point

n) $f''(x) = 0$

Optimization – 1st & 2nd Derivative Tests

8. The management of a large store wishes to add a fenced-in rectangular storage yard of 20,000 square feet, using the building as one side of the yard. Find the minimum amount of fencing that must be used to enclose the remaining 3 sides of the yard.

9. Two streets intersect at a right angle. Starting from the intersection, a person begins jogging away from the intersection along one of the streets at 9 ft/sec. A second person on the other street, riding a bicycle towards the intersection at 13 ft/sec, is 100 feet from the intersection at the time the first person begins jogging. At what time is the distance between the two people minimized? What is that distance?

Related Rates of Change

10. A 5-meter-long ladder is leaning against the side of a house. The foot of the ladder is pulled away from the house at a rate of 0.4m/sec. Determine how fast the top of the ladder is descending when the foot of the ladder is 3 meters from the house.

11. Gravel falling from a conveyor belt forms a conical pile whose height is increasing at a rate of 0.5 ft/min. If the radius of the base of the pile is always half the height, find the rate of change of the volume of the gravel pile when the height is 10ft.