

1. Find the average rate of change of $f(x) = x^2 - 6x - 1$ on $[-1,3]$.
2. A projectile is shot upward from the surface of the earth according to the position function $s(t) = -16t^2 + 256t$.
 - a) Find the velocity when $t = 1$.
 - b) At what time does the projectile reach its maximum height?
 - c) What is the max height?
 - d) How long does it take for the projectile to reach the ground?
 - e) What is the velocity when it hits the ground?
 - f) What is the acceleration function, $a(t)$?
3. Find $f'(x)$
 - a) $f(x) = \frac{3x^5 - 7x + 10}{\sqrt{x}}$
 - b) $f(x) = (3x + 2)^{10}(x^2 + 7x)$
 - c) $f(x) = \frac{(5x+7)^{50}}{2x-3}$
 - d) $f(x) = [2x + 3(5x + 1)^{10}]^{100}$
4. Find $\frac{dy}{dx}$ if $xy^2 - yx^2 = 2$. Find the equation of the tangent line at $(1, 2)$.
5. A spherical balloon is inflated with air at the rate of 10 cu ft/min. How fast is the radius of the balloon increasing when the radius is 5 ft. /
6. Sand is falling off a conveyor belt onto a conical pile at the rate of 20 cu ft/min. The diameter of the base of the cone is approx. equal to the altitude. At what rate is the radius increasing when the pile is 10 ft. high?
7. A ladder 10 ft long is leaning against a building. The bottom of the ladder is being pulled away from the building at the rate of 3 ft/sec. How fast is the distance from the top of the ladder to the ground changing when the base of the ladder is 6 ft away from the building?

8. Find the absolute max and absolute min of $f(x) = (x - 2)^2$ on the interval $[1,5]$.

9. Find where f increases and decreases. Find all relative max and relative min's.

A) $f(x) = x^3 - 12x^2$ B) $f(x) = 3x^{2/3}(x - 2)$ C) $f(x) = \frac{x^2-16}{x-5}$ D) $f(x) = \frac{x^2-3x-4}{x-2}$

10. Find the intervals where f is concave up and concave down. Find inflection points.

A) $f(x) = x^3 + \frac{5x^2}{2} - 14x + 3$ B) $f(x) = 3x^4 + 4x^3 + 6x^2 + 1$

11. Find the "end-behavior" ($\lim_{x \rightarrow \infty} f(x)$ $\lim_{x \rightarrow -\infty} f(x)$)

A) $y = \frac{x^5-200x+3}{-2x^2+30}$ B) $y = \frac{\sqrt{x}-400}{\sqrt{x^2+2}}$ C) $y = \frac{7x^5-200x^4}{3x^5-7x^3+200}$ D) $y = -3x^{16} - 400x^{10}$

12. Sketch the curve. Find x-int, y-int, asympt., end-behavior, intervals where f inc and dec, max, min, intervals where f is concave up and down, and inflection points

A) $f(x) = x^4 - 4x^2$ B) $f(x) = 3x^4 - 20x^3 + 36x^2$ C) $f(x) = \frac{x^2}{x^2-1}$

13. State the mean value theorem. For $f(x) = \frac{x+1}{x}$ find all values c in $(\frac{1}{2}, 2)$ such that $f'(c) = \frac{f(b)-f(a)}{b-a}$.