

Name: _____
AP Calc AB

Date: _____
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A particle moves along the x -axis so that its acceleration at any time t is given by $a(t) = 6t - 18$. At time $t = 0$ the velocity of the particle is $v(0) = 24$, and at time $t = 1$ its position is $x(1) = 20$.

- (a) Write an expression for the velocity $v(t)$ of the particle at any time t .
- (b) For what values of t is the particle at rest?
- (c) Write an expression for the position $x(t)$ of the particle at any time t .
- (d) Find the total distance traveled by the particle from $t = 1$ to $t = 3$.

Differential Equations with Initial Conditions

1. State an equation of the curve whose slope at the point (x, y) is $3x^2$ if the curve contains the point whose coordinates are $(1, -1)$.
2. Acceleration due to gravity is -32 feet per second per second. A stone is thrown upward from the ground with an initial speed of 96 feet per second.
 - (A) Find the height to which the stone rises in t seconds.
 - (B) Find its maximum height.
 - (C) When is the velocity of the stone one-half its initial velocity?
 - (D) What is the height of the stone when its velocity is one-half its initial velocity?
3. Find $f(x)$ if $f''(x) = x^{-\frac{3}{2}}$, $f'(4) = 2$ and $f(0) = 0$.
4. $f''(x) = 6(x-1)$. Find $f(x)$ if $f(2) = 1$ and at the point whose coordinates are $(2, 1)$, the graph of $y = f(x)$ is tangent to the line given by the equation $3x - y - 5 = 0$.