

Antiderivatives- HW Problems

Find the following indefinite integrals

1. $\int (x - 4) dx$

2. $\int (4x^3 + 3x^2 + 1) dx$

3. $\int \left(\sqrt[3]{x^2} + \frac{1}{\sqrt{x}} \right) dx$

4. $\int \frac{2x^4 - \sqrt{x}}{x^3} dx$

5. $\int (y + 2)(y^3 - y) dy$

6. $\int (t^2 + 1)^2 dt$

7. $\int (2 \cos(x) - 3 \sin(x)) dx$

8. $\int (\sec^2(x) - (\csc(x))(\cot(x))) dx$

9. $\int (3x^2 + \cos(3x)) dx$

10. $\int [(\sec(2x))(\tan(2x)) + \csc^2(3x)] dx$

Solve the following differential equations.

11. $f'(x) = 2x + 3, \quad f(0) = 2$

12. $f'(x) = 3x^2 + \sin(x), \quad f(0) = 3$

13. $g'(t) = 3\sqrt{t} + \frac{1}{t^2}, \quad g(1) = 4$

14. A ball is thrown upwards from a height of 112 feet above the ground at an initial velocity of 96 ft/sec. Assuming that its acceleration due to gravity is -32 ft/sec^2

- a. Find the velocity function $v(t)$, $t \geq 0$.
- b. Find the position function $s(t)$, $t \geq 0$.
- c. Find the maximum height of the ball.
- d. When does the ball hit the ground?
- e. What is the velocity of the ball when it hits the ground?

15. Acceleration due to gravity on the moon is approximately -1.6 m/sec^2 . A stone is dropped from a cliff on the moon and hits the surface 30 sec later. How far did it fall and what was its velocity on impact?