AP Calculus AB 4.1 Day 1

Find the indefinite integral.

1) $\int (x+3)dx$ $\frac{1}{2}x^2 + 3x + C$

2) $\int (2x - 3x^2)dx$ $x^2 - x^3 + C$

3) $\int (x^3 + 2)dx$ $\frac{1}{4}x^4 + 2x + C$

4) $\int (x^{3/2} + 2x + 1)\, dx$ $\frac{2}{5}x^{5/2} + x^2 + x + C$

5) $\int \sqrt[3]{x^2}\, dx$ $\frac{3}{5}x^{5/3} + C$

6) $\int \frac{1}{x^3} dx$ $-\frac{1}{2x^2} + C$

7) $\int \frac{x^2 + x + 1}{\sqrt{x}} dx$ $\frac{2}{5}x^{5/2} + \frac{2}{3}x^{3/2} + 2x^{1/2} + C$

8) $\int (x+1)(3x-2)\, dx$ $x^3 + \frac{1}{2}x^2 - 2x + C$

9) $\int y^2\sqrt{y}\, dy$ $\frac{2}{7}y^{7/2} + C$

$\int y^{5/2} dy$

10) $\int dx$ $x + C$

11) $\int (2\sin x + 3\cos x)\, dx$ $-2\cos x + 3\sin x + C$

12) $\int (1 - \csc t \cot t)\, dt$ $t + \csc t + C$

13) $\int (\sec^2\theta - \sin\theta)\, d\theta$ $\tan\theta + \cos\theta + C$

14) $\int (\tan^2 y + 1)dy$ $\tan y + C$

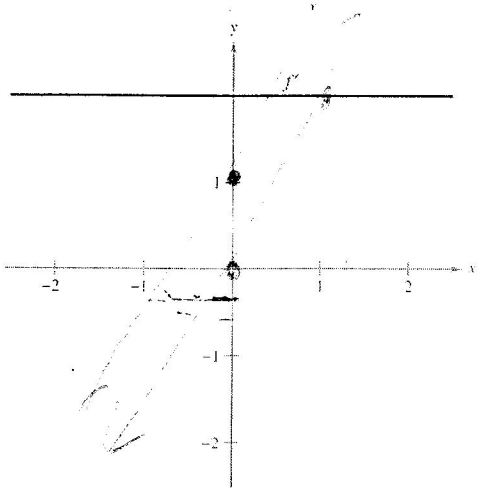
$\int \sec^2 y\, dy$

$\frac{\sin^2 x + \cos^2 x = 1}{\cos^2 x \qquad \cos^2 x}$

$\tan^2 x + 1 = \sec^2 x$

The graph of the derivative of a function is given. Sketch the graphs of two functions that have the given derivative.

15)

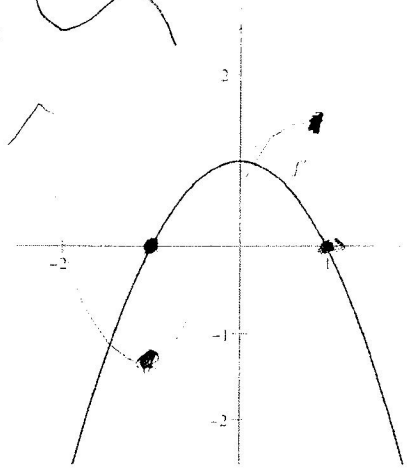


<answers vary>

$\frac{dy}{dx} = 2 \Rightarrow \int dy = \int 2\,dx$

$y = 2x + C$

16)



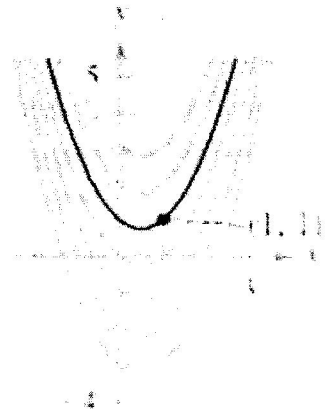
<answers vary>

$\frac{dy}{dx} = -x^2 + 1 \Rightarrow dy = (-x^2+1)dx$

$y = -\frac{1}{3}x^3 + x + C$

17) Find the equation for y, given the derivative and the indicated point.

$\frac{dy}{dx} = 2x - 1$



$\int dy = \int (2x-1)dx$

$y = x^2 - x + C$

$1 = (1)^2 - (1) + C$

$1 = C$

$\boxed{y = x^2 - x + 1}$

Solve the differential equation.

18) $f'(x) = 4x, \quad f(0) = 6$

$\frac{dy}{dx} = 4x$

$\int dy = \int 4x\,dx$

$y = 2x^2 + C$

$6 = 2(0)^2 + C$

$6 = C$

$\boxed{f(x) = 2x^2 + 6}$

19) $f''(x) = 2, \quad f'(2) = 5, \quad f(2) = 10$

$\int y'' = \int 2\,dx$

$y' = 2x + C$

$5 = 2(2) + C$

$1 = C$

$\int y' = \int (2x+1)dx$

$y = x^2 + x + C$

$10 = (2)^2 + (2) + C$

$4 = C$

$\boxed{f(x) = x^2 + x + 4}$

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