Name_____Date_____Class_____

Homework 6.1

For problems 1 – 12, find the indefinite integrals below.

1. $\int(\sqrt[3]{x}+3)dx = \int(x^{1/3}+3)dx$

$= \frac{3}{4}x^{4/3}+3x+C$

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

$= \frac{2}{5}x^5+\frac{3}{4}x^4+C$

3. $\int\left(\sqrt{x}+\frac{1}{2\sqrt{x}}\right)dx = \int(x^{1/2}+\frac{1}{2}x^{-1/2})dx$

$= \frac{2}{3}x^{3/2}+x^{1/2}+C$

4. $\int y^3\sqrt{y}\,dy = \int y^{6/2}y^{1/2}dy$

$= \int y^{7/2}dy$

$= \frac{2}{9}y^{9/2}+C$

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

6. $\int(x^{3/2}+2x+1)dx = \frac{2}{5}x^{5/2}+x^2+x+C$

7. $\int\frac{3x^2-2x+3}{x^3}dx = \int(3x^{-1}-2x^{-2}+3x^{-3})dx$

$= 3\ln|x|+2x^{-1}-\frac{3}{2}x^{-2}+C$

8. $\int\frac{1}{w\sqrt{w}}dw = \int w^{-1}w^{-1/2}dw$

$= \int w^{-3/2}dw$

$= -2w^{-1/2}+C$

9. $\int \frac{x^3+3}{\sqrt{x}}dx = \int (x^{5/2}+3)x^{-1/2}dx$

$= \int [x^{5/2}+3x^{-1/2}]dx$

$= \frac{2}{7}x^{7/2} + 6x^{1/2} + C$

10. $\int (\theta^2 + \cos\theta)d\theta = \frac{1}{3}\theta^3 + \sin\theta + C$

11. $\int (x+3)(x-3)^2 dx = \int (x+3)(x^2-6x-9)dx$

$= \int (x^3 - 6x^2 + 9x + 3x^2 - 18x + 27)dx$

$= \int (x^3 - 3x^2 - 9x + 27)dx$

$= \frac{1}{4}x^4 - x^3 - \frac{9}{2}x^2 + 27x + C$

12. $\int (\sqrt{x} - \sin x + 2)dx$

$= \frac{2}{3}x^{3/2} + \cos x + 2x + C$

For problems 13 and 14, find the indicated function based on the given information.

13. If $f'(x) = 2x - \sin x$ and $f(0) = 4$, find $f(x)$.

$f(x) = \int (2x - \sin x)dx = x^2 + \cos x + C$

$\boxed{f(0)=4}$

$4 = (0)^2 + \cos(0) + C$

$4 = 0 + 1 + C$

$3 = C$

$\therefore f(x) = x^2 + \cos x + 3$

14. If $f''(x) = x^2$, $f'(0) = 6$, and $f(0) = 3$, find $f(x)$.

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

$\boxed{f'(0)=6}$

$6 = \frac{1}{3}(0)^3 + C$

$6 = C$

$f'(x) = \frac{1}{3}x^3 + 6$

$f(x) = \int (\frac{1}{3}x^3 + 6)dx = \frac{1}{12}x^4 + 6x + C$

$\boxed{f(0)=3}$

$3 = \frac{1}{12}(0)^4 + 6(0) + C$

$3 = C$

$\therefore f(x) = \frac{1}{12}x^4 + 6x + 3$