Notes 22 Name ________________________

Antiderivatives (4.9)

Indefinite Integrals: *Evaluate the indefinite integral.*

1. $\int \left(3x^2 - x - e^x\right)\,dx$

$\frac{3x^3}{3} - \frac{x^2}{2} - e^x + c$

$\boxed{x^3 - \frac{1}{2}x^2 - e^x + c}$

2. $\int \sec(x+5)\tan(x+5)\,dx$

$\boxed{\sec(x+5) + c}$

Initial Value: *Find y or f(x) using the initial value.*

3. $\frac{dy}{dx} = \cos 5x, \quad y\left(\frac{\pi}{4}\right) = 2$

$y = \frac{\sin 5x}{5} + c$

$2 = \frac{\sin 5\left(\frac{\pi}{4}\right)}{5} + c$

$2 = \frac{\sin \frac{5\pi}{4}}{5} + c$

$2 = -\frac{\sqrt{2}}{2} \cdot \frac{1}{5} + c$

$2 = -\frac{\sqrt{2}}{10} + c$

$\frac{20+\sqrt{2}}{10} = c$

$\boxed{y = \frac{\sin 5x}{5} + \frac{20+\sqrt{2}}{10}}$

4. $f''(x) = \frac{3}{\sqrt{x}}, \quad f(4) = 20, \quad f'(4) = 7$

$f''(x) = 3x^{-1/2}$

$f'(x) = \frac{3x^{1/2}}{1/2} + c$

$f'(x) = 6x^{1/2} + c$

$7 = 6(4)^{1/2} + c$

$7 = 12 + c$

$c = -5$

$f'(x) = 6x^{1/2} - 5$

$f(x) = \frac{6x^{3/2}}{3/2} - 5x + D$

$f(x) = 4x^{3/2} - 5x + D$

$20 = 4(4)^{3/2} - 5(4) + D$

$20 = 32 - 20 + D$

$D = 8$

$\boxed{f(x) = 4x^{3/2} - 5x + 8}$

Indefinite Integrals: *Evaluate the Indefinite Integral.*

5. $\int \frac{x^3+3x-4}{x^2}\,dx$

$\int (x+3x^{-1}-4x^{-2})\,dx$

$\frac{x^2}{2}+3\ln x-\frac{4x^{-1}}{-1}+C$

$\boxed{\frac{1}{2}x^2+3\ln x+\frac{4}{x}+C}$

6. $\int(\cos x+\sin x)\,dx$

$\boxed{\sin x-\cos x+C}$

Initial Value: *Find y or f(x) using the initial value.*

7. $\frac{dy}{dx}=2x-\frac{3}{x^4},\quad x>0,\quad y(1)=3$

$y=\frac{2x^2}{2}-\frac{3x^{-3}}{-3}+C$

$y=x^2+x^{-3}+C$

$3=1^2+1^{-3}+C$

$1=C$

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

8. $f''(x)=x^3-2x+1,\quad f(0)=0,\quad f'(0)=1$

$f'(x)=\frac{x^4}{4}-\frac{2x^2}{2}+x+C$

$1=\frac{0^4}{4}-(0)^2+0+C$

$1=C$

$f'(x)=\frac{1}{4}x^4-x^2+x+1$

$f(x)=\frac{1}{20}x^5-\frac{x^3}{3}+\frac{x^2}{2}+x+D$

$0=0-0+0+0+D$

$D=0$

$\boxed{f(x)=\frac{1}{20}x^5-\frac{1}{3}x^3+\frac{1}{2}x^2+x}$