AP Calculus AB - Worksheet 39 **Integrate with initial values**

Find the general solution to the exact differential equation.

1. $\frac{dy}{dx}=5x^4-\sec^2 x$	2. $\frac{dy}{dx}=\sin x-e^{-x}+8x^3$	3. $\frac{dy}{dx}=\frac{1}{x}-\frac{1}{x^2},\ (x>0)$	4. $\frac{dy}{dt}=3t^2\cos\left(t^3\right)$
5. $\frac{dy}{dx}=3\sin x$; $y=2$ when $x=0$	6. $\frac{dy}{dx}=2e^x-\cos x$; $y=3$ when $x=0$	7. $f'(x)=7x^6-3x^2+5$; $f(1)=1$	8. $y'=10x^9+5x^4-2x+4$; $y=6$ when $x=1$
9. $f'(x)=-\frac{1}{x^2}-\frac{3}{x^4}+12$; $f(1)=3$	10. $\frac{dy}{dx}=5\sec^2 x-\frac{3}{2}\sqrt{x}$; $y\|_{x=0}=7$	11. $\frac{dx}{dt}=\frac{1}{t}-\frac{1}{t^2}+6$; $x=0$ when $t=1$	12. $\frac{dv}{dt}=4\sec t\tan t+e^t+6t$; $v=5$ when $t=0$

13. Find the specific solution to the following second-order initial value problem by first finding $\frac{dy}{dx}$ and then finding *y*: $\frac{d^2y}{dx^2}=24x^2-10$. When $x=1$, $\frac{dy}{dx}=3$ and $y=5$.	14. Find the specific solution to the following second-order initial value problem by first finding $f'(x)$ and then finding $f(x)$: $f''(x)=\cos x-\sin x$. $f'(0)=2$ and $f(0)=0$

Answers:

1. $y=x^5-\tan x+C$	2. $y=-\cos x+e^{-x}+2x^4+C$	3. $y=\ln x+x^{-1}+C$	4. $y=\sin\left(t^3\right)+C$
5. $y=-3\cos x+5$	6. $y=2e^x-\sin x+1$	7. $f(x)=x^7-x^3+5x-4$;	8. $y=x^{10}+x^5-x^2+4x+1$;
9. $f(x)=x^{-1}+x^{-3}+12x-11$	10. $y=5\tan x-x^{\frac{3}{2}}+7$; $(0<x<\frac{\pi}{2})$	11. $x=\ln t+t^{-1}+6t-7$; $(t>0)$	12. $v=4\sec t+e^t+3t^2$; $\left(-\frac{\pi}{2}<t<\frac{\pi}{2}\right)$ Note that $C = 0$.

13. $y=2x^4-5x^2+5x+3$	14. $f(x)=-\cos x+\sin x+x+1$