AP Calculus AB - Worksheet 48 **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. $\frac{dy}{dt} = 3t^2 \cos\left(t^3\right)$

Find the particular solution to the differential equation.

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. $\frac{dy}{dx} = 5\sec^2 x - \frac{3}{2}\sqrt{x}$; $y\big\|_{x=0} = 7$	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. $\frac{d^2y}{dx^2} = 24x^2 - 10$. When $x = 1$, $\frac{dy}{dx} = 3$ and $y = 5$.		14. $f''(x) = \cos x - \sin x$. $f'(0) = 2$ 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. $f(x) = -\cos x + \sin x + x + 1$	