HW Review p. 373 1-4, 11-14, 25, 29, 37, 38, 60

Tuesday, March 3, 2015 9:32 AM

(1) $\int_0^{\frac{\pi}{3}} \sec^2\theta \, d\theta = \tan\theta \Big|_0^{\frac{\pi}{3}} = \tan\frac{\pi}{3} - \tan 0 = \sqrt{3} - 0 = \boxed{\sqrt{3}}$

(2) $\int_1^2 \left(x + \frac{1}{x^2}\right) dx = \left(\frac{1}{2}x^2 - \frac{1}{x}\right)\Big|_1^2 = \left(\frac{1}{2}(2)^2 - \frac{1}{2}\right) - \left(\frac{1}{2}(1)^2 - \frac{1}{1}\right)$

$= \frac{3}{2} - \left(-\frac{1}{2}\right) = \boxed{2}$

(3) $\int_0^1 \frac{36\,dx}{(2x+1)^3} = 18\int_1^3 \frac{1}{u^3}\,du = 18\left(-\frac{1}{2}\right)u^{-2}\Big|_1^3 = \frac{-9}{u^2}\Big|_1^3 = \frac{-9}{3^2} - \frac{-9}{1^2} =$

$= -1 + 9 = \boxed{8}$

$u = 2x+1$ $\quad u(0) = 1$

$\frac{du}{dx} = 2$ $\quad u(1) = 3$

$du = 2dx$

$18\,du = 36\,dx$

(4) $\int_{-1}^1 2x\sin(1-x^2)\,dx = -\int_0^0 \sin u \, du = \boxed{0}$

$u = 1-x^2$ $\quad u(-1) = 0$

$\frac{du}{dx} = -2x$ $\quad u(1) = 0$

$-du = +2x\,dx$

(11) $\int \frac{\cos x}{2-\sin x}\,dx = -\int \frac{1}{u}\,du = -\ln|u| + C$

$= \boxed{-\ln|2-\sin x| + C}$

$u = 2-\sin x$

$du = -\cos x\,dx$

(12) $\int \frac{dx}{\sqrt[3]{3x+4}} = \frac{1}{3}\int \frac{1}{u^{1/3}} = \frac{1}{3}\int u^{-1/3} = \frac{1}{3}\left(\frac{3}{2}\right)u^{\frac{2}{3}} + C$

$= \boxed{\frac{1}{2}(3x+4)^{2/3} + C}$

$u = 3x+4$

$du = 3dx$

$\frac{1}{3}du = dx$

(13) $\int \frac{t\,dt}{t^2+5} = \frac{1}{2}\int \frac{1}{u}\,du = \frac{1}{2}\ln|u| + C$

$= \frac{1}{2}\ln|t^2+5| + C$

$= \boxed{\frac{1}{2}\ln(t^2+5) + C}$

$u = t^2+5$

$du = 2t\,dt$

$\frac{1}{2}du = t\,dt$

$du = 2t\,dt$

$\frac{1}{2}du = t\,dt$

$= \boxed{\frac{1}{2}\ln(t^2+5) + C}$

(14) $\int \frac{1}{\theta^2} \sec\frac{1}{\theta} \tan\frac{1}{\theta}\, d\theta$

$u = \frac{1}{\theta}$ $\quad = -\int \sec u \tan u\, du$

$du = -\frac{1}{\theta^2}d\theta$ $\quad = -\sec u + C$

$= \boxed{-\sec\frac{1}{\theta} + C}$

(25) $\int \frac{dy}{dx} = \int 1 + x + \frac{x^2}{2} \qquad y(0) = 1$

$y = x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + C$

$1 = 0 + 0 + 0 + C$

$1 = C$

So $\boxed{y = x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + 1}$

(29) $\int \frac{d^2y}{dx^2} = \int 2x - \frac{1}{x^2} \quad , x > 0 \qquad y'(1) = 1 \quad y(1) = 0$

$\frac{dy}{dx} = x^2 + \frac{1}{x} + C$

$1 = 1^2 + \frac{1}{1} + C$

$-1 = C$

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

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

$0 = \frac{1}{3}(1)^3 + \ln 1 - 1 + C$ $\qquad x > 0$ given

$0 = \frac{1}{3} + 0 - 1 + C$

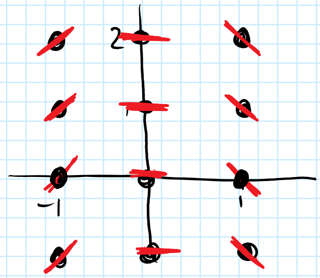
$\frac{2}{3} = C$ $\qquad$ So $\boxed{y = \frac{1}{3}x^3 + \ln x - x + \frac{2}{3}}$

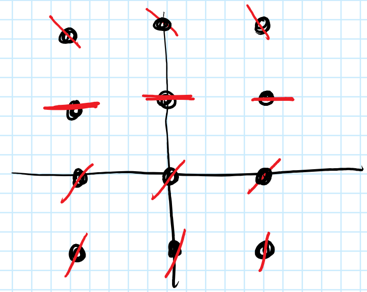
(37) $\frac{dy}{dx} = -x$

2

(38) $\frac{dy}{dx} = 1 - y$

dx





(60) show $y = \int_0^x \sin(t^2)\,dt + x^3 + x + 2$ is a solution of $\int y'' = \int 2x\cos(x^2) + 6x$

and $y'(0) = 1$

$y(0) = 2$ $\quad y' = \sin(x^2) + 3x^2 + C$

$1 = \sin(0^2) + 3(0)^2 + C$

$1 = C$

$\int y' = \int \sin(x^2) + 3x^2 + 1$

$y = \int_0^x \sin(t^2)\,dt + x^3 + x + C$

$2 = \int_0^0 \sin(t^2)\,dt + 0 + 0 + C$

$2 = C$

So $y = \int_0^x \sin(t^2)\,dt + x^3 + x + 2$ ✓