(2) $\int 2t \times (3t^2-1)^{1/2}\,dx$

Using $\int a\,dx = a \times x$

$2t \times (3t^2-1)^{1/2} \times x$

$2t\sqrt{3t^2-1}\,x$

$2t\sqrt{3t^2-1}\,x + C$

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

Using substitution let $t = 4x^2-1$

$\cancel{\int \frac{2x}{t^{1/2}}\,dx}$ $\int \frac{1}{4t^{1/2}}\,dt$

$\frac{1}{4} \times \int \frac{1}{t^{1/2}}\,dt$

$\frac{1}{4} \times \sqrt{2t}$

Recall $t = 4x^2-1$

$\frac{1}{4} \times 2\sqrt{4x^2-1}$

$\frac{1}{2} \times \sqrt{4x^2-1} + C$

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(1) $\frac{d}{dx}\left[\frac{(x+1)^2 \times (x-2)^{1/2}}{(2x-1)\times(x-3)^{1/3}}\right]$

Use of quotient rule.

Let: $u = (x+1)^2(x-2)^{1/2}$ $\quad v = (2x-1)\times(x-3)^{1/3}$

$$\frac{d/dx\left((x+1)^2(x-2)^{1/2}\right)\times(2x-1)(x-3)^{1/3} - (x+1)^2(x-2)^{1/2}\times\frac{d}{dx}(2x-1)(x-3)^{1/3}}{(2x-1)\times(x-3)^{1/3}}$$

$$\frac{\left(2(x+1)(x-2)^{1/2} + (x+1)^2\times\frac{1}{2}(x-2)^{-1/2}\right)\times(2x-1)(x-3)^{1/3} - (x+1)^2(x-2)^{1/2}\left(2(x-3)^{1/3} + \frac{(2x-1)^{1/3}(x-3)}{}\right)}{\left((2x-1)(x-3)^{1/3}\right)}$$

$$\frac{14x^4-70x^3+9x^2+47x-130}{6\sqrt[6]{(x-2)^3\times(x^2-6x+9}\times(2x-1)|x-3|}$$

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(1) $\int (4\sec^2(3m+1))\,dm$

$4\int \sec^2(3m+1)\,dm$

let $t = 3m+1$

$4 \times \int \frac{\sec^2 t}{3}\,dt$

$4 \times \frac{1}{3} \times \int \sec^2 t\,dt$

$\frac{4}{3}\int \sec^2 t\,dt$

$\frac{4}{3} \times \tan t$

Recall $t = 3m+1$

$\frac{4}{3} \times \tan(3m+1)$

$\frac{4\tan(3m+1)}{3} + C$

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(2) $\frac{d}{dk}\left(\frac{3e^{k}\sin 2k}{k^{5/2}}\right)$

let $u = 3e^{k}\sin 2k$ and $v = k^{5/2}$.

Using quotient rule.

$$\frac{v\frac{du}{dk} - u\frac{dv}{dk}}{v^2}$$

$$\frac{\left(\frac{d}{dk}(3e^{k}\sin 2k) \times k^{5/2}\right) - \left((3e^{k} \times \sin 2k) \times \frac{d}{dk}(k^{5/2})\right)}{(k^{5/2})^2}$$

$$\frac{\left[(3e^{k}\sin 2k) + (3e^{k}\cos 2k \times 2)\right]k^{5/2} - \left[(3e^{k} \times \sin 2k) \times \right.}{(k^{5/2})^2}$$

$$\frac{\left(6k^2\sqrt{k}e^{k} \times \sin 2k + 12k^2\sqrt{k}e^{k} \times \cos 2k\right) - \left(15\sqrt{k}e^{k} \times \sin 2\right.}{2k^5}$$

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