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78–87 ⇒ 9
69–77 ⇒ 8
59–68 ⇒ 7
50–58 ⇒ 6
–49 ⇒ 5

1. Evaluate each of the following:

(a) $\int (3t-4)^5\, dt$

$= \frac{1}{6}(3t-4)^6\left(\frac{1}{3}\right) + C$ +3 +1

$= \frac{1}{18}(3t-4)^6 + C$

(c) $\int_0^1 (4x^3 - 7x^2 + 3x - 2)\, x\, dx$

$= \int_0^1 (4x^4 - 7x^3 + 3x^2 - 2x)\, dx$

$= \frac{4}{5}x^5 - \frac{7}{4}x^4 + x^3 - x^2 \Big|_0^1$

$= \frac{4}{5} - \frac{7}{4} + 1 - 1$

$= -\frac{19}{20}$

8 each ⇒ 32

(b) $\int_{\frac{\pi}{6}}^{\frac{2\pi}{3}} \sin(x)\, dx$

$= -\cos(x)\Big|_{\frac{\pi}{6}}^{\frac{2\pi}{3}}$ +3

$= -\cos\left(\frac{2\pi}{3}\right) + \cos\left(\frac{\pi}{6}\right)$ } +2

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

$= \frac{\sqrt{3}+1}{2}$ } +3

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

$= \int (x^2 - 2x)\, dx$ +3

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

+4 +1

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Math 262 Calculus II Lab 2 Calc I Integration Review Name: KEY

(e) $\int \tan^2(x)\sec^2(x)\, dx$

$= \int u^2\, du$

$= \frac{1}{3}\tan^3(x) + C$

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

$= \int \frac{(x-3)(x+1)}{x+1}\, dx$

$= \int (x-3)\, dx$ } +4

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

(f) $\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \sin^4(x)\cos(x)\, dx$

$= \frac{1}{5}\sin^5(x)\Big|_{\frac{\pi}{6}}^{\frac{\pi}{2}}$

$= \frac{1}{5}\sin^5\left(\frac{\pi}{2}\right) - \frac{1}{5}\sin^5\left(\frac{\pi}{6}\right)$

$= \frac{1}{5}(1) - \frac{1}{5}\left(\frac{1}{2}\right)^5$

$= \frac{1}{5}\left(1 - \frac{1}{32}\right)$

$= \frac{31}{160}$

$= .19375$ (exact)

(h) $\int_{-2}^{3} (2x-5)(3x+1)\, dx$

$= \int_{-2}^{3} (6x^2 - 13x - 5)\, dx$

$= 2x^3 - \frac{13}{2}x^2 - 5x \Big|_{-2}^{3}$

$= 54 - \frac{117}{2} - 15 - (-16 - 26 + 10)$

$= 39 - \frac{117}{2} + 32$

$= \frac{142 - 117}{2}$

$= \frac{25}{2}$

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(i) $\int_{13}^{20} x\sqrt{x^2-144}\,dx$

$= \frac{1}{2}\cdot\frac{2}{3}(x^2-144)^{3/2}\Big|_{13}^{20}$

$= \frac{1}{3}\left[(400-144)^{3/2} - (169-144)^{3/2}\right]$

$= \frac{1}{3}\left[\overset{4096}{256\cdot 16} - \overset{125}{25\cdot 5}\right]$

$= \frac{3971}{3}$

$= 1323 + \frac{2}{3}$

(j) $\int \frac{7x^2\cos(x^3)}{\sin^3(x^3)}\,dx$ $u = \sin(x^3)$, $du = \cos(x^3)\,3x^2\,dx$

$= \frac{7}{3}\int \frac{du}{u^3}$

$= \frac{7}{3}\cdot\frac{1}{-2}\cdot u^{-2} + C$

$= -\frac{7}{6}\sin^{-2}(x^3) + C$

$= \frac{-7}{6\sin^2(x^3)} + C$

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2. ~~Use the Fundemental Theorem of Calculus to~~ Evaluate each of the following:

(a) $\int \frac{d}{dx}(\sin(\sqrt[3]{x}))\,dx \quad = \sin(\sqrt[3]{x}) + C$

(b) $\frac{d}{dx}\int \tan(x^2+1)\,dx \quad = \tan(x^2+1)$

5 each $\Rightarrow$ 15

(c) $\frac{d}{dx}\int_0^{\cancel{7}\ \frac{\pi}{6}} \frac{\sin(3x^2)}{\cos(2x)}\,dx \quad = 0$

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$\frac{7}{3}\int \frac{\cos u}{\sin^3 u}\,du = \frac{7}{3}\int \cot u\,\csc^2 u\,du = -\frac{7}{3}\int u$

$= -\frac{7}{6}u^2 + c$

$= -\frac{7}{6}\cot^2(u)$

$\boxed{-\frac{7}{6}\cot^2(u)} + \frac{7}{6}\csc^2(u)$

$= \frac{7}{6}\left(\csc^2(u) - \cot^2(u)\right)$

$= \frac{7}{6}$ ✓

$s^2 + c^2 = 1$

$1 + \cot^2 x = \csc^2 x$