Sample Test 4 Solutions

$\boxed{1.}$ (a) $\sqrt{3x^3 - x}$

(b) $x^2\sqrt{3-x^2}\,(2x)$

(c) $-x\sqrt{3-x}$

(d) 0 (deriv. of a constant)

(e) $1 + x + x^2 + x^3$

(f) $x + \frac{1}{2}x^2 + \frac{1}{3}x^3 + \frac{1}{4}x^4$

(g) $e^x + C$

(h) $-\cos x + C$

(i) $\sin x + C$

(j) $\ln|\sec x| + C$

(k) $\tan x + C$

(l) $\sec x + C$

(m) $\ln|x| + C$

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

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

(p) $\int x^{3/2} + x^{1/2}\,dx = \frac{2}{5}x^{5/2} + \frac{2}{3}x^{3/2} + C$

(q) $u = \sqrt{x}$ $\quad = \int \sin(u)\cdot 2du$

$du = \frac{dx}{2\sqrt{x}}$ $\quad = -2\cos(\sqrt{x}) + C$

(r) $\frac{1}{2}\left[\frac{1}{4}(2x-3)^4 + \frac{1}{3}(2x-3)^3 + \frac{1}{2}(2x-3)^2\right] +$

(s) $\frac{1}{3}\left(-\cos(3x-2)\right) + C$

(t) $14e^{(x+5)/7} + C$

(u) $e^{\sin x} + C$

(v) $\int_0^1 3 + x\,dx = 3 + \frac{1}{2}$

(w) $= \int_{-4}^{4} 2\,dx = 2\cdot 8 = 16$

$\boxed{2.}$ $-4 \le f(x) \le -2$ on $[0,2]$

gives $\int_0^2 -4\,dx \le \int_0^2 f(x)\,dx \le \int_0^2 -2\,dx$

which says

$$-8 \le \int_0^2 f(x)\,dx \le -4$$

$\boxed{3.}$ Subdivide $[1,4]$ into $[1,2]$, $[2,3]$, $[3,4]$

pick Sample points: I'll choose $\frac{3}{2}, \frac{5}{2}, \frac{7}{2}$ (mid points). Then

$$\int_1^4 \frac{1}{x}\,dx \approx \frac{1}{3/2}\cdot 1 + \frac{1}{5/2}\cdot 1 + \frac{1}{7/2}\cdot 1$$

(widths are all 1)

$$= \frac{2}{3} + \frac{2}{5} + \frac{2}{7}$$

$$= \frac{142}{105}$$