NAME: SOLUTIONS

QUIZ 9b

Dawson College
Course Code: 201-NYA-05 S07
Date: April 16th 2010
Instructor: E. Richer

Question 1. *(2.5 marks each)*
Integrate the following.

(a)

$$\int 2x^4 - x^{\frac{-1}{3}}\,dx \quad = 2\frac{x^5}{5} - \frac{x^{2/3}}{2/3} + C = \boxed{\tfrac{2}{5}x^5 - \tfrac{3}{2}x^{2/3} + C}$$

(b)

$$\int \sec^2 x + \cos x - \sin x + 3\sqrt{x}\,dx \quad = \tan x + \sin x + \cos x + \frac{3x^{3/2}}{3/2} + C$$
$$= \boxed{\tan x + \sin x + \cos x + 2x^{3/2} + C}$$

(c)

$$\int \left(\frac{2}{x^3}\right)(2x^5 - 3x^2 + 2)\,dx \quad = \int 4x^2 - 6x^{-1} + 4x^{-3}\,dx$$
$$= \frac{4x^3}{3} - 6\ln|x| + \frac{4x^{-2}}{-2} + C = \boxed{\frac{4}{3}x^3 - 6\ln|x| - \frac{2}{x^2} + C}$$

(d)

$$\int \left(\frac{-1}{x^5} + \frac{\sqrt{x}}{5x^3}\right)dx \quad = \int -x^{-5} + \frac{1}{5}x^{-5/2}\,dx$$
$$= \boxed{\frac{x^{-4}}{4} - \frac{2}{15}x^{-3/2} + C}$$

Question 2. *(5 marks)*
Find a function $h(t)$ satisfying whose second derivative $h''(t)$ is 2 and with slope of tangent line equal to 3 at the point $(-1, 1)$.

$h'(t) = 2t + C$
$3 = 2(-1) + C$
$C = 5$

$h'(t) = 2t + 5$
$h(t) = t^2 + 5t + C$
$1 = 1 - 5 + C$
$C = 5$

$\boxed{h(t) = t^2 + 5t + 5}$

Question 3. *(5 marks)*
Use substitution to integrate the following:

$$\int 5x\cos(3x^2 - 1)\,dx$$

$u = 3x^2 - 1$
$du = 6x\,dx \qquad x\,dx = \frac{1}{6}du$

$$= \int \frac{5}{6}\cos u\,du$$
$$= \frac{5}{6}\sin u + C = \boxed{\tfrac{5}{6}\sin(3x^2 - 1) + C}$$

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Question 1. *(2.5 marks each)*

Integrate the following.

(a)

$$\int 2x^6 - x^{\frac{1}{3}}dx = 2\frac{x^7}{7} - \frac{x^{4/3}}{4/3} + C = \boxed{2/7\, x^7 - 3/4\, x^{4/3} + C}$$

(b)

$$\int \sec^2 x - \cos x - \sin x + \sqrt{x}dx = \boxed{\tan x - \sin x + \cos x + \frac{x^{3/2}}{3/2} + C}$$

(c)

$$\int (\frac{2}{x^3})(2x^4 - 3x + 2)dx = \int 4x - 6x^{-2} + 4x^{-3}dx = \frac{4x^2}{2} - \frac{6x^{-1}}{-1} + \frac{4x^{-2}}{-2} + C$$

$$= \boxed{2x^2 + 6/x - 2/x^2 + C}$$

(d)

$$\int \left(\frac{-1}{x^3} + \frac{\sqrt{x}}{5x^2}\right) dx = \int -x^{-3} + \frac{1}{5}x^{-3/2}dx = \frac{x^{-2}}{2} - \frac{1}{5}\frac{x^{-1/2}}{1/2} + C$$

$$= \boxed{\frac{1}{2x^2} - \frac{2}{5\sqrt{x}} + C}$$

Question 2. *(5 marks)*

Find a function $h(t)$ satisfying whose second derivative $h''(t)$ is 3 and with slope of tangent line equal to 2 at the point $(-1, 1)$.

$h'(t) = 3t + C$

$2 = 3(-1) + C$

$C = 5$

$h'(t) = 3t + 5$

$h(t) = 3t^2/2 + 5t + C$

$+1 = 3(1/2) - 5 + C$

$C = 1 - 3/2 + 5 = 4.5$

$\boxed{h(t) = 3t^2/2 + 5t + 9/2}$

Question 3. *(5 marks)*

Use substitution to integrate the following:

$$\int 3x\sin(2x^2 + 3)dx$$

$u = 2x^2 + 3$

$du = 4x\,dx$

$\frac{1}{4}du = x\,dx$

$$= \int 3\left(\frac{1}{4}\right)\sin u\, du$$

$= -3/4 \cos u + C$

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