WRITE YOUR NAME:

MAC 2312 Homework 1
Due in class, Friday January 20th
You can use more paper if necessary, but please STAPLE

Question 1. Evaluate the integral.

$$\int \left(5x + \frac{2}{3x^5}\right) dx$$

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

$$= 5\int x\,dx + \frac{2}{3}\int x^{-5}\,dx$$

$$= 5 \cdot \frac{x^2}{2} + \frac{2}{3} \cdot \frac{x^{-4}}{-4} + C$$

$$= \frac{5}{2}x^2 - \frac{1}{6}x^{-4} + C$$

or $\frac{5}{2}x^2 - \frac{1}{6x^4} + C$

Question 2. Evaluate the integral.

$$\int x(1+x^3)\,dx$$

$$= \int (x + x^4)\,dx$$

$$= \int x\,dx + \int x^4\,dx$$

$$= \frac{x^2}{2} + \frac{x^5}{5} + C$$

Question 3. Evaluate the integral.

$$\int \frac{x^5 + 2x^2 - 1}{x^4}\, dx$$

$$= \int \left(\frac{x^5}{x^4} + \frac{2x^2}{x^4} - \frac{1}{x^4} \right) dx$$

$$= \int \left(x + 2x^{-2} - x^{-4} \right) dx$$

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

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

Question 4. Evaluate the integral.

$$\int (4x-3)^9\,dx$$

Substitute $u = 4x - 3$

Then $\frac{du}{dx} = 4$

$du = 4\,dx$

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

$$\int (4x-3)^9\,dx = \int u^9 \cdot \frac{1}{4}\,du$$

$$= \frac{1}{4}\int u^9\,du = \frac{1}{4}\cdot\frac{u^{10}}{10} + C$$

$$= \frac{u^{10}}{40} + C = \frac{(4x-3)^{10}}{40} + C$$

Question 5. Evaluate the integral.

$$\int x^3\sqrt{5+x^4}\,dx$$

Substitute $u = 5 + x^4$

Then $\frac{du}{dx} = 4x^3$

$du = 4x^3\,dx$

$\frac{1}{4}\,du = x^3\,dx$

Integral $= \int \sqrt{5+x^4}\; x^3\,dx = \int \sqrt{u}\cdot\frac{1}{4}\,du$

$= \frac{1}{4}\int u^{1/2}\,du = \frac{1}{4}\cdot\frac{u^{3/2}}{3/2} + C$

$= \frac{1}{4}\cdot\frac{2}{3}u^{3/2} + C = \frac{1}{6}u^{3/2} + C$

$= \frac{1}{6}(5+x^4)^{3/2} + C$