

For full credit you must (NEATLY) show your work. Partial credit may be given for incorrect solutions if sufficient work is shown.

Evaluate the following integrals.

1. (5 pts)

$$\begin{aligned}\int \left(4x^3 - 2x^2 + \frac{1}{x}\right) dx &= 4 \int x^3 dx - 2 \int x^2 dx + \int x^{-1} dx \\ &= 4 \frac{x^4}{4} - 2 \frac{x^3}{3} + \ln |x| + C \\ &= \boxed{x^4 - \frac{2}{3}x^3 + \ln |x| + C}\end{aligned}$$

2. (5 pts)

$$\int \sqrt{x^4 - 3x^2} (8x^3 - 12x) dx$$

$$u = x^4 - 3x^2$$

$$\frac{du}{dx} = 4x^3 - 6x$$

$$du = (4x^3 - 6x) dx$$

$$2du = (8x^3 - 12x) dx.$$

Now we convert the integral to be entirely in terms of  $u$  and  $du$ .

$$\begin{aligned}\int \sqrt{x^4 - 3x^2} (8x^3 - 12x) dx &= \int \sqrt{u} \cdot 2du \\ &= 2 \int u^{1/2} du \\ &= 2 \frac{u^{3/2}}{3/2} + C \\ &= \frac{4}{3} u^{3/2} + C.\end{aligned}$$

Finally we convert back to  $x$ .

$$\int \sqrt{x^4 - 3x^2} (8x^3 - 12x) dx = \boxed{\frac{4}{3}(x^4 - 3x^2)^{3/2} + C}$$