

HW4 Calc II

$$\textcircled{1} \int \frac{x^2 dx}{6x - x^2} \quad \left(\text{Hint: } \int \frac{x^2 dx}{6x - x^2} = - \int \frac{x^2 dx}{x^2 - 6x} \right)$$

$$\textcircled{2} \int \frac{dx}{\sqrt{x^2 - 2x - 8}}$$

IBP (Integration by parts)

$$\text{FYI: } \int \sin^n x dx = -\frac{1}{n} \sin^{n-1}(x) \cos x + \frac{n-1}{n} \int \sin^{n-2}(x) dx$$

$$\textcircled{3} \int x \ln x dx$$

$$\textcircled{4} \int e^x \sin x dx$$

$$\textcircled{5} \int \ln(a^2 + x^2) dx$$

$$\textcircled{6} \int x^2 \ln x dx$$

Show that the following reduction statements are ~~false~~ true for all positive integers:

$$\textcircled{7} \int (\ln x)^n dx = x (\ln x)^n - n \int (\ln x)^{n-1} dx$$

$$\textcircled{8} \int x^n \cos x dx = x^n \sin x - n \int x^{n-1} \sin x dx$$

$$\textcircled{9} \int x^n \sin x dx = -x^n \cos x + n \int x^{n-1} \cos x dx$$

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$$(10) \quad \cancel{\int} \int x^n e^x dx = x^n e^x - n \int x^{n-1} e^x dx$$

$$(11) \quad \int \cos^n x dx = \frac{1}{n} \cos^{n-1}(x) \sin(x) + \frac{n-1}{n} \int \cos^{n-2}(x) dx$$

Hint: start with choosing $u = \cos^{n-1}(x)$ and
 $dv = \cos x dx$

Use the reduction formulas to find:

$$(12) \quad \int (\ln x)^5 dx$$

$$(13) \quad \int x^4 \sin x dx$$

$$(14) \quad \int \cos^4 x dx$$