

Solutions to Dunning Exam 2

$$(1) \frac{d}{dx} u(x)^n = n \cdot u(x)^{n-1} \cdot u'(x) \quad \text{Power Rule}$$

$$\frac{d}{dx} e^{u(x)} = e^{u(x)} \cdot u'(x) \quad \text{Exponential Rule}$$

$$\frac{d}{dx} \ln u(x) = \frac{u'(x)}{u(x)} \quad \text{Log Rule}$$

$$(2) \int u'(x) \cdot u(x)^n dx = \frac{u(x)^{n+1}}{n+1} + C \quad \text{Power Rule}$$

$$\int u'(x) \cdot e^{u(x)} dx = e^{u(x)} + C \quad \text{Exponential}$$

$$\int \frac{u'(x)}{u(x)} dx = \ln |u(x)| + C \quad \text{Log Rule}$$

(3) Log Rules - see special assignment.

$$(4) I_4 = \int (3x^2 + 10x^4) (2x^3 + 4x^5)^9 dx$$

check if

$$\text{fits} \int u'(x) \cdot u(x)^n dx = \frac{u(x)^{n+1}}{n+1} + C$$

power rule.

$$u(x) = 2x^3 + 4x^5$$

$$u'(x) = 6x^2 + 20x^4 = 2(3x^2 + 10x^4) \quad \text{Need this for}$$

power rule to work.

$$I_4 = \frac{1}{2} \int 2(3x^2 + 10x^4) (2x^3 + 4x^5)^9 dx \quad \Rightarrow \text{missing } 2$$

$$= \frac{1}{2} \cdot \frac{(2x^3 + 4x^5)^{10}}{10} = \boxed{\frac{(2x^3 + 4x^5)^{10}}{20} + C}$$