

Math 165 Sp'10 Exam II (1) Solutions

1. (a) $\frac{d}{dx} u(x)^n = n \cdot u(x)^{n-1} \cdot u'(x)$ (from chain rule)

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

$$\frac{d}{dx} \ln u(x) = \frac{u'(x)}{u(x)}$$

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

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

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

2. $I_2 = \int 8(2x^3 + 5x^5) \cdot (3x^4 + 5x^6)^7 dx$

check if it's power rule.

$$u(x) = 3x^4 + 5x^6 \quad u'(x) = 12x^3 + 30x^5 = 6 \cdot (2x^3 + 5x^5)$$

$$I_2 = 8 \int (2x^3 + 5x^5) \cdot (3x^4 + 5x^6)^7 dx$$

$$= 8 \cdot \frac{1}{6} \int 6(2x^3 + 5x^5) \cdot (3x^4 + 5x^6)^7 dx$$

$$= \frac{8}{3} \cdot \frac{(3x^4 + 5x^6)^8}{8}$$

$$I_2 = \frac{(3x^4 + 5x^6)^8}{6} + C$$

(1)