

Math 31 – Workshop #1

1. (a) Compute $\frac{d}{dx} \left(\frac{3}{2} e^{x^2} \right)$.

- (b) Which of the following integrals are you able to compute, just by having computed the above derivative?

$$\int \frac{3}{2} e^{x^2} dx \qquad \int 3x e^{x^2} dx \qquad \int e^{x^2} dx$$

2. Consider the integral $\int 3x^2 \sin(x^3) dx$.

- (a) If we let $u = x^3$, then what must go in the blank below?

$$\int 3x^2 \sin(x^3) dx = \int \text{_____} du$$

- (b) Do you think the new “ du ” integral will be easier, harder, or about the same difficulty to compute as the original “ dx ” integral?

3. Consider the integral $\int 5x e^{4x^2} dx$.

- (a) If we let $u = x^2$, then what must go in the blank below?

$$\int 5x e^{4x^2} dx = \int \text{_____} du$$

- (b) If we let $u = 4x^2$, then what must go in the blank below?

$$\int 5x e^{4x^2} dx = \int \text{_____} du$$

- (c) If we let $u = 2x$, then what must go in the blank below?

$$\int 5x e^{4x^2} dx = \int \text{_____} du$$

- (d) Do any of the new “ du ” integrals look like they will be easier to compute than the original “ dx ” integral? If so, which one(s)?

4. (a) If $u = x^2$, then what must go in the blank below?

$$\int \text{_____} dx = \int \frac{\sin u}{u^5} du$$

- (b) If $u = \tan x$, then what must go in the blank below?

$$\int \text{_____} dx = \int u^2 + 5u du$$

5. Compute the following integrals.

(a) $\int x\sqrt{5x^2 + 2} \, dx$

(b) $\int e^x\sqrt{2 + e^x} \, dx$

(c) $\int \frac{(\ln x)^5}{x} \, dx$

(d) $\int \frac{e^x}{e^x + 1} \, dx$