Math 30 – Workshop #29

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

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

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

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

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

   $$\int 3x^2\sin(x^3)\,dx = \int \_\_\_\_\_\,du$$

   (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 $\displaystyle\int 5xe^{4x^2}\,dx$.

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

   $$\int 5xe^{4x^2}\,dx = \int \_\_\_\_\_\,du$$

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

   $$\int 5xe^{4x^2}\,dx = \int \_\_\_\_\_\,du$$

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

   $$\int 5xe^{4x^2}\,dx = \int \_\_\_\_\_\,du$$

   (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?

   $$\int \_\_\_\_\_\,dx = \int \frac{\sin u}{u^5}\,du$$

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

   $$\int \_\_\_\_\_\,dx = \int u^2 + 5u\,du$$

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