

Friday, January 11

Clicker Questions

Clicker Question 1

A definite integral

Evaluate $\int_1^{e^2} \frac{1}{t} dt$.

- A. $1 - \frac{1}{e^4}$
- B. 2, since $\int_1^{e^2} \frac{1}{t} dt = \ln|x| \Big|_1^{e^2} = \ln(e^2) - \ln(1) = 2 - 0$
- C. $\ln(e^2) - 1$
- D. $\frac{1}{e^2} - 1$
- E. none of the above

Clicker Question 2

Checking up on FTC part 1

If $h(x) = \int_7^{x^5} t^3 dt$, calculate $h'(x)$.

- A. x^3
- B. $5x^4$
- C. x^{15}
- D. $5x^{19}$
- E. $3x^2$

The Chain Rule again

Write $g(x) = \int_7^x t^3 dt$, so that $g'(x) = x^3$ by FTC part 1. Since $h(x) = g(x^5)$, we see that

$$h'(x) = g'(x^5) \cdot 5x^4 = (x^5)^3 \cdot 5x^4 = 5x^{19}.$$

Clicker Question 3

An indefinite integral

If $a > 0$ is a constant, what is $\int a^x dx$?

A. $\frac{a^{x+1}}{x+1} + C$

B. $a^x + C$

C. $\frac{a^{x+1}}{a+1} + C$

D. $\frac{1}{\ln a} a^x + C$, as $\frac{d}{dx} \left(\frac{1}{\ln a} a^x + C \right) = \frac{1}{\ln a} \frac{d(a^x)}{dx} = \frac{1}{\ln a} ((\ln a) a^x)$

E. $(\ln a) a^x + C$

Clicker Question 4

What's the right question?

Which of the following indefinite integrals equals $x\sqrt{2x+3} + C$?

- A. $\int \frac{x}{\sqrt{2x+3}} dx$
- B. $\int (3\sqrt{x} + \sqrt{3}) dx$
- C. $\int \sqrt{2x+3} dx$
- D. $\int \frac{3x+3}{\sqrt{2x+3}} dx$
- E. none of the above

Indefinite integrals: sometimes easier to *check* than *find*!

$$\begin{aligned} & \frac{d}{dx}(x\sqrt{2x+3} + C) \\ &= 1 \cdot \sqrt{2x+3} + x \cdot \frac{1}{2} \frac{2}{\sqrt{2x+3}} \\ &= \frac{2x+3}{\sqrt{2x+3}} + x \cdot \frac{1}{2} \frac{2}{\sqrt{2x+3}} \\ &= \frac{3x+3}{\sqrt{2x+3}} \end{aligned}$$