Integration by Parts:
\[ \int u \, dv = uv - \int v \, du \]

Warm-up Problems

1. **Clicker** The integral below can be done with integration by parts:
   \[ \int (\ln x)^2 \, dx \]
   What is a good choice for \( u \)?
   (a) 1
   (b) \( \ln x \)
   (c) \( (\ln x)^2 \)
   (d) \( dx \)
   (e) It can’t be done by integration by parts.

2. In Problem [1] what is \( v \)?

Class Problems

3. \( \int e^x \cos x \, dx \)

4. \( \int e^x \sin x \, dx \)

5. \( \int e^{3x} \cos 4x \, dx \)

6. \( \int x^2 e^{3x} \, dx \)

7. \( \int x^3 e^{3x} \, dx \)

8. \( \int x \sin x \cos x \, dx \)

9. \( \int x \ln x \, dx \)

10. \( \int \frac{\ln x}{x^2} \, dx \).

11. \( \int \arctan x \, dx \)

12. \( \int 2x \arctan x \, dx \)
13. **Clicker** Choose the correct $u$ if using integration by parts: $\int (\text{Polynomial}(x))e^x \, dx$

   (a) $u = 1$  (b) $u = \text{Polynomial}(x)$  (c) $u = e^x$  (d) $u = \sin x$  (e) $u = \cos x$

14. **Clicker** Choose the correct $u$ if using integration by parts: $\int (\text{Polynomial}(x))\sin x \, dx$

   (a) $u = 1$  (b) $u = \text{Polynomial}(x)$  (c) $u = e^x$  (d) $u = \sin x$  (e) $u = \cos x$

15. **Clicker** Choose the correct $u$ if using integration by parts: $\int (\text{Polynomial}(x))\cos x \, dx$

   (a) $u = 1$  (b) $u = \text{Polynomial}(x)$  (c) $u = e^x$  (d) $u = \sin x$  (e) $u = \cos x$

16. **Clicker** Choose the correct $u$ if using integration by parts: $\int e^x \sin x \, dx$

   (a) $u = 1$  (b) $u = e^x$  (c) $u = \sin x$  (d) $u = \cos x$  (e) $u = \ln x$

17. **Clicker** Choose the correct $u$ if using integration by parts: $\int e^x \cos x \, dx$

   (a) $u = 1$  (b) $u = e^x$  (c) $u = \sin x$  (d) $u = \cos x$  (e) $u = \ln x$

18. **Clicker** Choose the correct $u$ if using integration by parts: $\int \ln x \, dx$ (a) $u = 1$  (b) $u = e^x$  (c) $u = \sin x$  (d) $u = \cos x$

   (e) $u = \ln x$

19. $\int \sin x \cos x \, dx$