MATH 2300, Calc 2

Calculating integrals - the big picture

January 15, 2015
Techniques you know so far:
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- Simplify integrand, or write in a different form
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▶ Simplify integrand, or write in a different form
▶ $u/du$ substitution
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- u/du substitution
- Integration by parts
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- Simplify integrand, or write in a different form
- u/du substitution
- Integration by parts
What technique do you think would work best?

\[ \int \frac{x^3 + \sqrt{x}}{\sqrt{x}} \, dx \]
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Simplify (distribute the denominator)
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\[ \int \frac{\sec \sqrt{x} \tan \sqrt{x}}{\sqrt{x}} \, dx \]

\[ u/du \text{ substitution}, \quad u = \sqrt{x}, \quad du = \frac{1}{2\sqrt{x}} \, dx \]
What technique do you think would work best?

\[
\int \frac{\sec \sqrt{x} \tan \sqrt{x}}{\sqrt{x}} \, dx = \int \sec \sqrt{x} \tan \sqrt{x} \cdot \frac{1}{\sqrt{x}} \, dx
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u/du substitution, \( u = \sqrt{x} \),
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u/du substitution, \( u = \sqrt{x}, \ du = \frac{1}{2\sqrt{x}} \, dx \)
What technique do you think would work best?

\[ \int x \ln x \, dx \]
What technique do you think would work best?

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Integration by parts,
What technique do you think would work best?

\[ \int x \ln x \, dx \]

Integration by parts, \( u = \ln x, \ dv = x \, dx \)
What technique do you think would work best?

\[ \int \frac{\ln x}{x} \, dx \]
What technique do you think would work best?

\[
\int \frac{\ln x}{x} \ dx = \int \ln x \cdot \frac{1}{x} \ dx
\]
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u/du substitution, \( u = \ln x, \ du = \frac{1}{x} \, dx \)
What technique do you think would work best?

\[ \int \frac{\arcsin x}{\sqrt{1 - x^2}} \, dx \]
What technique do you think would work best?

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\int \frac{\arcsin x}{\sqrt{1 - x^2}} \, dx \quad \int \arcsin x \cdot \frac{1}{\sqrt{1 - x^2}} \, dx
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What technique do you think would work best?

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What technique do you think would work best?

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u/du substitution, \( u = \arcsin x \), \( du = \frac{1}{\sqrt{1-x^2}} \, dx \)
What technique do you think would work best?

\[ \int x^2 \sin x \, dx \]
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Integration by parts,
What technique do you think would work best?

$$\int x^2 \sin x \, dx$$

Integration by parts, $u = x^2$, $dv = \sin x \, dx$
What technique do you think would work best?

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u/du substitution, \( u = x^2 \),
What technique do you think would work best?

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\( u/du \) substitution, \( u = x^2 \), \( du = 2x \, dx \)