Warm-up Problems

1. **Clicker** Explain the picture below and the Mean Value Theorem (MVT)

   ![Graph with tangent line and secant line](image)

   (a) Given $f(x)$ and $a < b$, there is a $c$ such that $f'(c) = \frac{f(b)-f(a)}{b-a}$

   (b) Given a function there is always a tangent line parallel to a secant line.

   (c) Given a tangent line, there is a parallel secant line

   (d) MVT? What are you talking about?

Class Problems

<table>
<thead>
<tr>
<th>Fundamental Theorem of Calculus</th>
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<tr>
<td>I. $\frac{d}{dx} \int_{a}^{x} f(t) , dt = f(x)$</td>
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2. **Clicker** Find the derivative

   \[ \frac{d}{dx} \int_{-x^2}^{e^x} \sin(t^2) \, dt \]

   (a) $e^x \sin(e^{2x}) - 2x \sin(x^4)$

   (b) $e^x \sin(e^{2x}) + 2x \sin(x^4)$

   (c) $\sin(e^{2x}) - \sin(x^4)$

   (d) $e^x \sin(e^{2x})$

   (e) I have no idea

3. (True/False) Any derivative formula gives a corresponding indefinite integral formula?
   (a) True (b) False (c) Neither True or False
4. Perform the given $u$-substitution on the given integral. If possible, compute the indefinite integral.

(a) $\int x^2 \sin(x^3 + 3) \, dx$

\[ u = x^3 \]
\[ du = \]

(b) $\int \sin(x^3 + 3) \, dx$

\[ u = x^3 \]
\[ du = \]

(c) $\int \tan x \, dx$

\[ u = \tan x \]
\[ du = \]

(d) $\int \tan x \, dx$

\[ u = \cos x \]
\[ du = \]