MAT137 - Calculus with proofs

- Assignment #6 due on January 28.
- Test 3 opens on February 5.

Unit 9: Integration methods

- FRIDAY: Substitution or Chain Rule
  (**Videos 9.1, 9.3**; Supplementary: 9.2)

- MONDAY: Parts or Product Rule
  (Videos: 9.4; Supplementary: 9.5, 9.6)

- WEDNESDAY: Products of trig functions
  (Videos: 9.7; Supplementary: 9.8, 9.9)

- FRIDAY: Rational functions
  (Videos: 9.10; Supplementary: 9.11, 9.12)

Compute these definite integrals

1. $\displaystyle\int_1^2 x^3 dx$

2. $\displaystyle\int_0^1 \left[e^x + e^{-x} - \cos(2x)\right] dx$

3. $\displaystyle\int_{\pi/4}^{\pi/3} \sec^2 x \, dx$

4. $\displaystyle\int_1^2 \left[\frac{d}{dx}\left(\frac{\sin^2 x}{1 + \arctan^2 x + e^{-x^2}}\right)\right] dx$

Areas

Calculate the area of the bounded region...

1. ... between the x-axis and $y = 4x - x^2$.
2. ... between $y = \sin x$ and the x-axis, from $x = 0$ to $x = 2\pi$.
3. ... between $y = x^2 + 3$ and $y = 3x + 1$.
4. ... between $y = 1$, the y-axis, and $y = \ln(x + 1)$.

More True or False

We want to find a function H with domain $\mathbb{R}$ such that $H(1) = -2$ and such that $H'(x) = e^{\sin x}$ for all x. Decide whether each of the following statements is true or false.

1. The function $H(x) = \int_0^x e^{\sin t} dt$ is a solution.
2. $\forall C \in \mathbb{R}$, the function $H(x) = \int_0^x e^{\sin t} dt + C$ is a solution.
3. $\exists C \in \mathbb{R}$ s.t. the function $H(x) = \int_0^x e^{\sin t} dt + C$ is a solution.
4. The function $H(x) = \int_1^x e^{\sin t} dt - 2$ is a solution.
5. There is more than one solution.