Exam and Review parallels

- **Exam problem 1:** Use the definition of the derivative to prove this special case of the product rule:
$$\frac{d}{dx}xf(x) = f(x) + xf'(x).$$

  Review problem 1: Use the definition of the derivative to prove this special case of the product rule:
$$\frac{d}{dx}x^2f(x) = 2xf(x) + x^2f'(x).$$

- **Exam Problem 2:** Use the fact that $\sec(x) = 1/\cos(x)$ to show that $\dfrac{d}{dx}\sec(x) = \sec(x)\tan(x)$.

  Review Problem 3: Prove the following differentiation rules using a simpler differentiation rule:

  (a) $\frac{d}{dx}\tan(x) = \sec^2(x)$

- **Exam Problem 3:** Write the equation $y = x^{-x^2}$ as $\ln(y) = \ln(x^{-x^2})$ and differentiate both sides implicitly with respect to x to find y' in terms of x.

  Review Problem 2: Compute the following derivatives

  (d) $y = x^{2x}$

- **Exam problem 5:** Find an equation of the line tangent to the curve $x^4y + 3xy^3 = -2$ at the point $(-1, 1)$.

  Review problem 5: Find an equation of the line tangent to the curve $x^3y^2 + 2x^3y^4 = 3$ at the point $(1, 1)$.

- **Exam problem 6:** Find the absolute maximum and minimum of $f(x) = \dfrac{x}{2} + \dfrac{1}{x}$ over the interval $[1, 4]$.

  Review problem 7: Find the absolute maximum and minimum of $f(x) = x^3e^{-\frac{1}{2}x^4}$ over the interval $[-1, 2]$.

  In class from Feb 29 #2: Find all absolute and relative extremes of $f(x) = x + 2/x$ over the interval $[1/2, 3]$.

- **Exam problem 7:** In this problem, we'll explore the possibility that $\dfrac{d}{dx}\arcsin(x) = \dfrac{1}{\sqrt{1-x^2}}$.

  Review problem 8: In this problem, we'll explore the possibility that $\frac{d}{dx}\sin(x) = \cos(x)$.