

### Calculus Review problem bank

1. Find all solutions  $(x, y)$  to the following:

$$xy - x + 2y = 2$$

$$x^2 + 5x + 4y = 0$$

2. Let  $g(x) = \ln\left(\frac{x^2}{\sin x}\right)$ . Find  $g'(x)$ .
3. Find the tangent line to  $f(x) = xe^x$  at  $x = 2$ .
4. Let  $h(x) = 2x^3 - 9x^2 + 12x - \pi^2$ . Find the critical points of  $h(x)$  and classify them as local max, local min, or neither.
5. Find  $\int \frac{x^2 + 3x - 2}{x} dx$ .
6. For  $x > 0$ , find  $\frac{d}{dx} \left( \int_{\sqrt{x}}^{x^2} \sin(t^2) dt \right)$ .
7. Find  $\int \frac{2}{e^x + 2} dx$ .
8. Find the volume of the solid formed by spinning the region  $0 \leq x \leq \frac{\pi}{4}$  and  $0 \leq y \leq \tan(x)$  around the  $x$ -axis.
9. Find the second order Taylor polynomial of  $f(x) = \arctan x$  centered at  $x = 0$ .
10. Write  $r = 2 \sin \theta$  in Cartesian coordinates and sketch the curve.