WORKSHEET 21

Antiderivatives

9 April 2020

- 1. (**Review**) Find the derivative of $f(x) = \ln(\sin(x))e^{2x}$
- 2. (Warm-up) Suppose that F is an antiderivative of f and G is an antiderivative of g. That is, F'(x) = f(x) and G'(x) = g(x). Answer the following with True or False.
 - (a) If f = g, then F = G.
 - (b) If F and G differ by a constant (that is, F(x) = G(x) + k for some constant k), then f = g.
 - (c) If f and g differ by a constant, then F = G.
- 3. Suppose F is an antiderivative of f.
 - (a) Show that $\frac{1}{2}F(2x)$ is an antiderivative of f(2x).
 - (b) What is the antiderivative of f(kx), where k is a constant?
- 4. Find the antiderivatives of the following functions. You can check your answers by differentiating.
 - (a) x^3
 - (b) e^{3x}
 - (c) $\frac{1}{x}$
 - (d) $3x^2 + 4x + 2$
 - (e) (Challenge) $2x\sin(x) + x^2\cos(x)$
 - (f) (Challenge) $\cos(x^2) \cdot 2x$

5. A base jumper dives off a cliff that is 200 meters high.

- (a) Assuming that the acceleration due to gravity is approximately 9.8 m/s, what is his velocity as a function of time?
- (b) What is his position as a function of time?
- (c) He pulls his chute when he is 100 meters off the ground. What is his speed at this instant?