**Problem 1.** Consider the function $f(x) = \sin(2x)$ on the interval $[0, 2\pi]$.

1. Find the critical numbers and inflections points on the interval

2. Find the intervals where the function is increasing and decreasing

3. Find the intervals of positive/negative concavity

**Problem 2.** Let f(x) be a twice-differentiable function, such that f"(x) $\leq$ 0. We also know that f(0)=2 and f'(0)=2. Find the maximum possible value of f(3).

**Problem 3.** A drone is hovering next to a flagpole. Let North of the flagpole be positive and So9uth be negative in the coordinate frame. The drone displacement relative the flagpole can be expressed by a single maneuver that lasts 4 seconds is given by the function:

$$s(t) = at^3 + bt^2 + c, t\epsilon[0, 4]$$

(a) Exactly quarter way through the maneuver, the drone's velocity reads 0 ft/s for an instant. Three fourths of the way through, it is 27 ft South of the flagpole. With this information, can you find the absolute maximum displacement of the drone from the flagpole?

(b) Suppose another maneuver is performed. However, this time, all you know is that the onboard accelerometer reads 0 halfway through and the drone is located 16 ft South. What is the absolute maximum displacement of the drone from the flagpole in this case?

(c) It is safe to fly the drone up with an acceleration up to 1.5 g's or $50 ft/s^2$ without causing permanent structural failure. Are these maneuvers structurally safe for the drone?