

Math 273 - Fall 2015
Practice Midterm 3

- (1) Find the (exact) maximum and minimum values of $f(x) = x - 2\sin x$ on the interval $[0, 2\pi]$.
- (2) Let $f(x) = x^3 - 4x$.
 - (a) Find the intervals on which f is increasing or decreasing.
 - (b) Find the local maxima and minima of f .
 - (c) Find the intervals on which f is concave up or concave down.
 - (d) Find the inflection points of f .
 - (e) Sketch the curve.
- (3) Find the limits of the following functions.
 - (a) $\lim_{x \rightarrow 0^+} \frac{\sqrt{x}}{\ln x}$.
 - (b) $\lim_{x \rightarrow 0} \frac{\sin(x) - x}{e^x x^3 - 1}$.
 - (c) $\lim_{x \rightarrow 0} \frac{\sqrt{x}}{\sin(x) - 1}$.
 - (d) $\lim_{x \rightarrow 0^+} \frac{\sqrt{x}}{\ln x}$.
- (4) Find $f(x)$ given the information below.
 - (a) $f'(x) = x - \sqrt{x} + 1/x$.
 - (b) $f'(x) = \sin(x) + \cos(x)$.
 - (c) $f''(x) = 4e^x + 1$, $f'(0) = 1$, $f(0) = 2$.
- (5) Find the rectangle of largest area that can be inscribed in a semicircle of radius r .
- (6) Find the point on the line $y = 2x + 3$ that is closest to the origin.
- (7) A stone is dropped off of a cliff. It accelerates downward due to gravity at 32 ft/sec and hits the ground travelling 120 ft/sec. How high was the cliff?
- (8) Show that the equation $2x + \cos x = 0$ has exactly one real root.