Final Exam Review

1. (a) Approximate the area under the curve \( y = \sin x \) from \( x = 0 \) to \( x = \pi/2 \) by dividing the interval from \([0, \pi/2]\) into 2 subintervals of equal length and using two approximating rectangles. Use the value of the function \( f(x) = \sin x \) at the right hand endpoints of the subintervals for the heights of your rectangles.

(b) Is your answer from part 1a greater than or less than \( \int_{0}^{\pi/2} \sin x \, dx \)?

2. Evaluate the following expressions

(a) \( \frac{d}{dx} \int_{1}^{x^2} \sin 2t \, dt \)
(b) \( \int \tan x \, dx \)

(c) \( \int_{-1}^{1} x^3 \cos(x) \, dx \)

(d) \( \int_{0}^{1} (x - 1)(x + 2) \, dx \)

(e) \( \int_{e}^{e^2} \frac{\ln x}{x} \, dx \)
(f) \( \int_{-4}^{0} \sqrt{16 - x^2} \, dx \)

(g) \( \sin^{-1}(\sin(\pi)) \)

(h) \( \sin^{-1}(\sin(0)) \)

(i) \( \sin^2(\pi/4) \)
(j) \( \frac{d}{dx} \cos^2(\cos(x^2)) \)

(k) \( \lim_{x \to \frac{\pi}{2}} \frac{\cos x}{x - \frac{\pi}{2}} \)

(l) \( \lim_{x \to \infty} \frac{\sin x}{e^x} \)