Solutions
MATH 191, FALL 2009
QUIZ 2

Instructions: Write your name at the top. You have ten minutes to complete the following four questions. Show your work as clearly as possible. No calculators, books, or notes are allowed.

1. Calculate the following:
   a) \( \sin^{-1}(\sqrt{2}/2) = \frac{\pi}{4} \)

   \( \text{Note: } \sin^{-1} \text{ always takes values between } -\frac{\pi}{2} \text{ and } \frac{\pi}{2}. \)

   b) \( \cos^{-1}(\cos(12\pi/11)) = \frac{10\pi}{11} \)

2. Calculate the following:
   a) \( \log_3(9) = 2 \) (16\( \cdot \)3² = 3\cdot3 = 9)

   b) \( \log_2(1/8) = -3 \) (16\( \cdot \)2³ = \( \frac{1}{2} \)² = \( \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8} \)

3. If a ball is dropped from a building, the distance it has fallen after \( t \) seconds is given by \( d = 16t^2 \). If a ball is dropped (at time \( t = 0 \)) from a 200 foot building, what is its average velocity over the time period \( 1 < t < 3 \)?

   \[ \text{Avg. vel.} = \text{slope of secant from } (1, 16 \cdot 1^2) \text{ to } (3, 16 \cdot 3^2) \]

   \[ \text{for } t \in (1, 3) \]

   \[ = \frac{16 \cdot 3^2 - 16 \cdot 1^2}{3 - 1} = \frac{16 \cdot 9 - 16}{2} \]

   \[ = \frac{16 \cdot 8}{2} = 8 \cdot 8 = 64 \text{ ft/sec} \]

   It is merely a coincidence that after 2 seconds, the ball has fallen \( 16 \cdot 2^2 = 16 \cdot 4 = 64 \text{ feet} \).