Math 101- Major Quiz

Sr. Num.: ID. Num.: Name: Sec. Num.:

Q 1(3.1): Consider the following curve $f(x) = 1/x$. For what values of x does the slope equal to $-1/16$?

Q 2(3.2): Find the derivative of $f(x) = \frac{-x}{x+1}$ at $x = 1$.

Q 3(3.3): At how many points does the curve $y = x^4 - 8x^2 + e$ have horizontal tangents?

Q 4(3.4): A dynamite blast blows a heavy rock straight up with a launch velocity of 98 m/sec. It reaches a height of $s = 98t - 4.9t^2$ m after t seconds. How high does the rock go?

Q 5(3.5): Find $\lim_{x\to 0} \frac{\sqrt{2+secx}}{sin(\frac{\pi}{2}-tanx)}$

Q 6(3.6): Use the power chain rule to find $\frac{d}{dx}(5x^3 - x^4)^3$ at $x = 1$.

Q 7(3.7): Find dy/dx at the point $P(0, -1)$ if $y^2 = x^2 + cos(xy)$.

Q 8(3.8): A line with slope m passes through the origin and is tangent to the graph of $y = log(x)$. Find m.

Q 9(3.9): Find $\frac{d}{dx} sec^{-1}(\sqrt{5}x^3)$ at $x = -1$.

Q 10(3.10): A hot air balloon rising straight up from a level field tracked by a range finder 500 ft from the liftoff point. At the moment the range finder's elevation angle is $\pi/4$, the angle is increasing at the rate of 0.1 rad/min. How fast is the rising at the moment?

Q 11(3.11): Find the differential $d(tan3x)$ at $x = 0$.

Q 12(4.1): Find the sum of the absolute maximum and minimum of $f(x) = 2x(2 - lnx)$ over $[1, e^2]$.

Q 13(4.2): A function f, whose derivative is $sin(x)$, passes through the point $P(\frac{\pi}{2}, 6)$. Find $f(0)$.

Q 14(4.3): Find the open interval where the function $f(x) = 2x^3 - 24x + 5$ is decreasing.

Q 15(4.4): Let $y = x^4 - 4x^3 - 2$. Find the x-coordinates of all inflection points, if any.

Q 16(4.5): Find $\lim_{t \to 0^+} \sqrt{t}\ log(t)$.

Q 17(4.6): An open box is to be made by cutting small congruent squares from the corners of a 20 cm by 20 cm sheet of tin and bedding up the sides. How large should the squares cut from the corners be to make the box hold as much as possible?

Q 18(4.6) A rectangle is to be inscribed in a semicircle of radius 3 m. What is the largest area the rectangle can have?

Q 19(4.7): Use Newton's method to find the first approximation (x_1) of the point where the curve $y = x^3 - x + 3$ crosses the horizontal line $y = 4$. Start with $x_0 = 1$.

Q 20(4.8): A hot-air balloon ascending at the rate of 10 m/s is at a height of 20 m above the ground when a package is dropped. Find the height of the package just one second later. (Hint: $S''(t) = -9.8m/s^2$).