Math 1120 Homework #2

Due: Friday, July 26th.

Name: NAME GOES HERE

Initialization (clear memory and load some extra plotting tools)...

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> restart;
  with(plots):
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Problem 1a) Plot $y = \sin(x^2)$ where $0 \le x \le \sqrt{2\pi}$. Then find a decimal approximation of this graph's arc length.

Be careful about capitalization of pi! Also, "sqrt(x)" computes the square root of x.

1b) Find b such that when we go from $x = 0$ to $x = b$ we have moved 2 units along the curve $y = \sin(x^2)$. Then plot $y = \sin(x^2)$ with $0 \le x \le \sqrt{2\pi}$ (as you did in part 1a) together with a plot $y = \sin(x^2)$ with $0 \le x \le b$ where this **second plot** is **colored in blue** and has its **thickness set to 5**.

Note: Store your plots under some names like plot1 and plot2. Then use display({plot1,plot2}); to display plot1 and plot2 together.

Problem 2) Compute each of the following: $\int \frac{e^x}{x}\,dx$, $\int_0^{\infty} \frac{\sin(x)}{x}\,dx$, and $\frac{d^{10}}{dx^{10}}\left(e^{2x}\cos(3x)\right)$.

It might be helpful to note that "x$3" means "x,x,x" so "x$10" repeats x 10 times.

Problem 3) The mean height of an NBA player is 79 inches (i.e., 6'7") with a standard deviation of 3.5. Assume that there are 450 NBA players and their heights are distributed normally.

3a) About how many players are between 72 and 84 inches tall (i.e., in the 6 foot range)?

About ??? players are in the six foot height range.

3b) About how many players are 6' tall or shorter?

About ??? players are no taller than 6 feet.

3c) How tall must a player be to be among the tallest 5% of NBA players?

Any player about ??? inches or taller is among the tallest 5% of NBA players.

Problem 4) A rocket has acceleration given by $a(t) = 5e^{-\frac{t}{100}} \sin\left(\frac{t}{2}\right) - 5$ meters per second^2 where t is measured in seconds from blast off. Its initial velocity is 50 meters per second and its initial position is 5 meters above the ground.

4a) Find the rocket's position function (i.e., $x(t)$ should be the rocket's altitude t seconds after launch at time $t = 0$). Then plot the rocket's position function for what should be the first 30 seconds of flight.

Notice that the rocket does not fly that long (it hits the ground before 30 seconds).

Hint: int(g(u),u=0..t) + A; will yield a function whose derivative is g(t) and is A when t=0.

4b) When does the rocket hit the ground?

After flying about ??? seconds, the rocket hits the ground.