Quiz 4 (100 points) Due in class 6/15/2018 Name:

NOTE: YOU MUST SHOW YOUR WORK TO RECEIVE FULL CREDIT. REMEMBER TO BOX YOUR FINAL ANSWER(S).

1. (30pts) Let $a > 0$ and b and c be constants.
   (a) What is the concavity of $q(x) = ax^2 + bx + c$?
   (b) What is the concavity of $q(x) = -ax^2 + bx + c$?
   (c) What is the relationship between the sign of the x^2 coefficient and the concavity?
2. (30 pts) Drake once said "the square root of 69 is 8 something". Use the calculus technique from class to get a better estimate of $\sqrt{69}$ and help him figure it out. (Hint: See the Derivatives in Wild Notes)
3. (40 pts) Let $h(x) = \dfrac{x^n}{e^x}$ be defined on the interval $(0,\infty)$ with n an integer greater than or equal to 1. .
   (a) Differentiate $h(x)$.
   (b) Find the critical point of $h(x)$?
   (c) Is $h(x)$ increasing or decreasing to the right of the critical point?
   (d) Is $h(x)$ always positive or negative on $(0,\infty)$?
   (e) What do you think this says about how quickly e^x grows versus x^n as x becomes large?