Math 30	Exam III	April 5, 2018

Provide a clear and organized presentation. Show all of your work, completely simplify your answers, and give exact values only, unless otherwise indicated.

1. (15 pts) Use either a linear approximation or differentials to approximate  $\sqrt[3]{25}$ 

2. (20 pts) My cat *Pythagoras* stands 6 inches tall. He walks 2 ft/s directly away from a floor lamp in my living room that stands 6 feet tall. How fast is the tip of his shadow moving when he is 10 feet from the floor lamp?

3. (20 pts) My other cat *Theta* sits motionless, observing two mice. His lines of site to each of these mice are separated by 30°. The first mouse is 3 feet from *Theta*, whereas the second mouse is 5 feet from *Theta* at the one point in time when they both spot *Theta*. They immediately run directly away from , the first at 4 ft/s whereas the second at 6 ft/s. How fast is the distance between the two mice changing 2 seconds after they flee?



4. (15 pts) Determine the absolute extrema for *f* over [0,3] if  $f(x) = x^4 - 6x^3 + 12x^2 - 8x$ 

5. (15 pts) Determine the absolute extrema for f over  $\left[-\pi,\pi\right]$  if  $f(x) = x + 2\sin x$ 

6. (10 pts) Consider the following graph of y = f(x):



i) Determine all values of *x* for which *f* attains a relative maximum.

ii) Determine all values of *x* for which *f* attains a relative minimum.

- iii) Determine all values of *x* for which *f* attains an absolute maximum.
- iv) Determine all values of *x* for which *f* attains an absolute minimum.

7. (10 pts) Find y' if 
$$y = \tanh^3 \sqrt{x + e^{1-x^2}}$$