

Midterm 1

Time: 50 minutes

Show all work and justify your answers.

1. Find

$$\lim_{x \rightarrow 0^+} x^x.$$

2. Determine whether the series converges or diverges

$$\sum \frac{k^3 + 1}{\sqrt{k^6 + 5}}.$$

3. Determine whether the series converges or diverges

$$\sum \frac{2^k k!}{k^k}.$$

4. Use the summation formula for the geometric series to express

$$0.77777 \dots$$

as the ratio of two integers.

5. At a certain moment a 100-gallon mixing tank is full of brine containing 0.25 pound of salt per gallon. Find the amount of salt present t minutes later if brine is being continuously drawn off at the rate of 3 gallons per minute and replaced by brine containing 0.2 pound of salt per gallon.

Each problem is worth 20pts.