

AMS 161-Practice Final Exam-Fall 2018

NAME: _____

*Question 1 is worth 16 points. Questions 2 -7 are 14 points each. SHOW ALL WORK!

1. Determine if each converges or diverges and justify:

a) $\sum_{n=1}^{\infty} \frac{(2n)!}{2n!2^n}$

b) $\sum_{n=1}^{\infty} \left(5 + \frac{1}{n^{99}}\right)$

$$\text{c) } \sum_{n=2}^{\infty} \frac{\ln n}{n}$$

$$\text{d) } \sum_{n=1}^{\infty} \frac{26^n - 27^n}{100^n}$$

2. Sketch $F(x) = \int_{-1}^x \sqrt{t^3 + 1} dt$ using the fundamental theorem of calculus. Accurate y values are not required here.

3. If the half-life of a radioactive substance is 10 years, how long will it take to decay by 30% assuming the rate of change of this substance is directly proportional to the amount present? Derive any formulas you use by solving a differential equation!

4. .Compute:

a) $\int x \sin x dx$

b) $\int \frac{1}{x(\ln x)^2} dx$

5. For which positive values of p does the following converge? Prove using the integral test.

$$\sum_{n=1}^{\infty} \frac{1}{n^p}$$

6. Draw the image of the square with vertices $0, 1, i, 1 + i$ in the w plane if $w = f(z) = (1 - i)z$ and discuss the transformations as they relate to $f'(z)$.

7) If the acceleration of an object is given by $\frac{dv}{dt} = -2v$, find the position function $s(t)$ if $v(0) = 7$ and $s(0) = 0$