Please evaluate this class by going to **my.unt.edu** and filling out the SETE survey before May 4. It will only take between 5 and 20 minutes, depending on how many comments you wish to include.

1. Does the sequence below converge? If so find its limit.
$$a_n = \sqrt{\frac{2n+3}{3n-1}}$$
2. Find the formula for the n^{th} term of the sequence that starts
$$1, \frac{-3}{5}, \frac{5}{25}, \frac{-7}{125}, \ldots$$
3. Does the sequence below converge? If so find its limit.
$$c_n = \sqrt[n]{3n+12}$$
4. Compute $\displaystyle\sum_{n=0}^{\infty}(-1)^n \frac{1}{3^{n/2}}$
5. Compute $\displaystyle\sum_{n=1}^{\infty} \frac{2}{4n^2-1}$
6. Determine if the series converges or diverges. Justify carefully. $\displaystyle\sum_{n=1}^{\infty} \frac{2n-1}{3n^3+n^2+1}$
7. Determine if the series converges or diverges. Justify carefully.
$$\sum_{n=1}^{\infty} \frac{1}{27n+100}$$
8. Determine if the series converges or diverges. Justify carefully.
$$\sum_{n=1}^{\infty} \left(1+\frac{1}{n}\right)^{-n^2}$$
9. Determine if the series converges or diverges. Justify carefully.
$$\sum_{n=1}^{\infty} \frac{n^2}{2n^3+5n+1}$$
10. Determine if the series converges or diverges. Justify carefully.
$$\sum_{n=1}^{\infty} n^3 e^{-n}$$
11. Determine if the series converges or diverges. Justify carefully.
$$\sum_{n=1}^{\infty} \frac{(n!)^3}{(3n)!}$$
12. For which values of p does the series converge?
$$\sum_{n=2}^{\infty} \frac{1}{n(\ln n)(\ln \ln n)^p}$$
13. Determine if the series converges absolutely, converges, or diverges. Justify carefully.
$$\sum_{n=1}^{\infty} (-1)^n(\sqrt{n+1}-\sqrt{n})$$

14. Determine if the series converges absolutely, converges, or diverges. Justify carefully.

$$\sum_{n=1}^{\infty} \frac{\cos n}{n^{3/2}}$$

15. How many terms do you need to add to get a number that is within 0.01 of the infinite sum for $\sum_{n=0}^{\infty} \frac{(-1)^n}{2n+3}$?

16. Find the radius and interval of convergence:

$$\sum_{n=0}^{\infty} \frac{n}{n+1}(x+2)^n$$

17. Find the radius and interval of convergence:

$$\sum_{n=1}^{\infty} \frac{2^n}{n} x^{2n+1}$$

18. Find the interval of convergence and the radius of convergence for

a)

$$\sum_{n=0}^{\infty} \frac{(-1)^n \sqrt[3]{n} x^n}{5^n}.$$

b)

$$\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{\sqrt[3]{n} 5^n}.$$

19. Find the interval of convergence and the radius of convergence for

$$\sum_{n=0}^{\infty} \frac{(-2)^n}{n!} x^{2n}.$$

20. Find the interval of convergence and the radius of convergence for

$$\sum_{n=0}^{\infty} (2)^{n^2} x^n.$$

21. Compute the derivative of the power series and compare the intervals of convergence of the series and its derivative.

$$\sum_{n=1}^{\infty} \frac{(x-2)^n}{n^2}$$

22. Compute the following:

$\frac{d}{dx}(e^{x^2} \arcsin x)$

23. Compute the following:

$\frac{d}{dx} \log_x(10+x)$

24. Compute the following:

$\frac{d}{dx} \ln(\sec x^2)$

25. Compute in two different ways:

$$\frac{d}{dx} x^{2x}$$

26. Compute: $\int \cot(x)\, dx$

27. Compute the following:

$\int \frac{2 \ln x^4}{x}\, dx$

28. Compute the following:

$\int (4^x - x^4)\, dx$

29. Compute the following:
$$\int \frac{1+x}{\sqrt{9-4x^2}}\,dx$$

30. Compute the following:
$$\int \frac{\arcsin(x)}{\sqrt{1-x^2}}\,dx$$

31. Compute the following:
$$\int \arctan x\,dx$$

32. Find the area under the graph of $y = \ln x$ and above the $x-$axis for $e \leq x \leq 2^2$.

33. Find the volume of the solid of revolution obtained by rotating the region bounded by the coordinate axes, $y = 3$, and $x = \dfrac{2}{\sqrt{y+1}}$ about the y-axes.

34. Find the length of the segment of the parabola $y = x^2$ with $0 \leq x \leq 1$.

35. A bug rides on the perimeter of a wheel of radius 1 along a straight road. What is the length of the path traveled by the bug every time the wheel turns one complete revolution?

36. Solve the differential equation:
$$y'x = \frac{2y^2}{x}$$

37. Solve the differential equation:
$$xy' = x^2 - y$$

38. Solve the differential equation $y' = xe^{-\sin x} - y\cos(x)$.

39. Solve the differential equation $y' = x^2y^2$.

40. Show the derivation for the Maclaurin expansion for $\sin x$ expanded at 0.

41. Derive the Taylor series for $\ln x$ centered at $x = e$.

42. Use algebra and known Taylor series to derive the Maclaurin series for $\cos(3x^2)$.

43. Derive the Maclaurin series for $\ln(2+x)$.

44. Find the power series centered at 0 for $\arctan(x)$. (First find the series for its derivative using know series.)

45. Use algebra and known Taylor series to derive the Taylor series for $\sin(2x)$.

46. Use the Taylor series to show $\frac{d}{dx}e^x = e^x$.

47. Use the remainder theorem to estimate the error from using the degree four Maclaurin approximation of $\cos x$ for $-0.5 < x < 0.5$. Can you use the alternating series error estimate to give another error estimate for this situation? If so, how do the two compare, if not, why not?

48. Use the remainder theorem to estimate the degree of the Maclaurin polynomial needed to approximate e^x to within 0.00001 for $-1 \leq x \leq 0.5$.

49. Show that for an even function, all the coefficients with an odd subscript in the Maclaurin expansion of the function are 0. What is the corresponding statement for even functions?

50. Find the first four terms of the binomial series for $(1-x)^{4/5}$.

51. Find the first four terms of the binomial series for $(1+x)^{3/2}$.

52. Find the first four terms of the binomial series for $(1-x)^{-3/5}$.

53. Compute the following:

$$\int \log_{10} x \; dx$$

54. Compute the following:

$$\int \frac{t^4+t^2-1}{t^3+t} \; dt$$

55. Compute the following:

$$\int 5x \sin(3x) \; dx$$

56. Compute the following:

$$\int \sin(\frac{t}{2}) e^{3t} \; dt$$

57. Compute the following:

$$\int x^3 \ln x^2 \; dx$$

58. Compute the following:

$$\int \frac{x}{(-3+x)\,(-2+x)} \, dx$$

59. Compute the following:

$$\int e^{\sqrt{x}} \; dx$$

60. Compute the following:

$$\int \sin(\ln x)) \; dx$$

61. Compute the following:

$$\int \frac{1}{\sqrt[4]{x}+\sqrt[3]{x}} \, dx$$

62. Compute the following:

$$\int \sqrt{x(5-x)} \, dx$$

63. Compute the following:

$$\int x^2 \sqrt[3]{x+1} \, dx$$

64. Compute the following:

$$\int \frac{x}{x^4+x^2+1} \, dx$$

65. Compute the following:

$$\int \frac{1}{\sin x + \cos x} \, dx$$

66. Compute the following:

$$\int \frac{1}{x\sqrt{4-x^2}} \, dx$$

67. Compute the following:

$$\int \frac{1}{x^2+6x+10} \, dx$$

68. Compute the following:

$$\int \ln(x + \sqrt{x^2 - 1})\, dx$$

69. Compute the following:

$$\int \frac{3x^4 - 11x^3 - 20x^2 + 13x - 51}{x^2 - 3x - 10}\, dx$$

70. Compute the following:

$$\int \sec^6 x\, dx$$

71. Compute the following:

$$\int \tan^5 x\, dx$$

72. Compute the following:

$$\int \sin^2 x\, \cos^5 x\, dx$$

73. Compute the following:

$$\int \sin^2 x\, \cos^4 x\, dx$$

74. Compute

$$\lim_{x \to \infty} (\sqrt{x + 10} - \sqrt{x})$$

75. Compute $\lim_{x \to \frac{\pi}{2}} \dfrac{\cos x}{x - \pi/2}$

76. Compute $\lim_{x \to 0^+} (1 - 3x)^{\frac{2}{5x}}$

77. Compute: $\lim_{x \to 0} \dfrac{2x - \ln(1 + 2x)}{x^2}$

78. Compute: $\lim_{x \to 1^-} x^{1/(1-x)}$

79. Compute: $\lim_{x \to 1^-} \dfrac{\int_x^1 e^{t^2}\, dt}{x - 1}$

80. For which values of p does the integral $\displaystyle\int_{10}^{\infty} \frac{1}{x \ln^p x}\, dx$ converge?

81. Compute: $\lim_{x \to \infty} x(\log_x(x + 1) - 1)$

82. Use Maclaurin series and properties of series to prove $\sin(a + x) = \sin(a)\cos(x) + \cos(a)\sin(x)$.

83. How many roots does the function $f(x) = e^x - 2(x + 4)^2 + 10$ have? Prove your answer.

84. Convert the polar coordinates $(2, \pi/6)$ to rectangular coordinates.

85. Convert the polar coordinates $(-5, -\pi/4)$ to rectangular coordinates.

86. Convert the polar coordinates $(4, -2\pi/3)$ to rectangular coordinates.

87. Convert the polar coordinates $(-6, -7\pi/4)$ to rectangular coordinates.

88. Convert the polar coordinates $(0, 3)$ to rectangular coordinates.

89. Convert the rectangular coordinates $(3, 4)$ to polar coordinates.

90. Convert the rectangular coordinates $(-3, 4)$ to polar coordinates.

91. Convert the rectangular coordinates $(3, -4)$ to polar coordinates.

92. Convert the rectangular coordinates $(-3, 4)$ to polar coordinates.

93. Convert the rectangular coordinates $(0, -4)$ to polar coordinates.

94. Find an equation in rectangular coordinates whose graph is the same figure as the graph of $2 = r\cos\theta + 3r\sin\theta$ in polar coordinates. Identify the graph.

95. Find an equation in rectangular coordinates whose graph is the same figure as the graph of $r = 4\cos\theta + 6\sin\theta$ in polar coordinates. Identify the graph.

96. Find an equation in polar coordinates whose graph coincides with the graph of $y = 3x + 2$ in rectangular coordinates.

97. Find an equation in polar coordinates whose graph coincides with the graph of $(x-1)^2 + (y-2)^2 = 25$ in rectangular coordinates.

98. Find the slope of the tangent line to the graph of the polar coordinate graph of $r = 3 + 2\theta$ at the point where $\theta = 1$.

99. Find the slope of the tangent line to the graph of the polar coordinate graph of $r = r\sin\theta$ at the point where $\theta = \pi/4$.

100. Find a parametric equation for the line between the points $(7, -3$ and $(4, 10)$. Now eliminate the parameter to find the equation of the line between the points.

101. Find a parametric equation of the circle that traverses the circle $(x-3)^2 + (y-4)^2 = 100$ in the clockwise direction once every minute and starts at the point (3,-6) at time 0.

102. Find the slope of the tangent line to the graph of the curve given parametrically by $x(t) = 3t^2 + 2x - 1$ and $y(t) = t^2 + 2$ at the point where $t = 1$.