This exam contains sixteen questions. The first fourteen are multiple choice questions and count for five points each. There is no partial credit on these questions, so read each question carefully, check your arithmetic and make sure that you have marked the answer you intended to mark. The last two questions, which are each worth fifteen points, require written answers, and some partial credit might be given. However, no credit will be given for information that is not germane to the problem at hand. Please make sure to write your name and student ID number on the pages that include your answers to the last two questions. In fact, you will get one point on each of these two questions for writing your name and ID number legibly.
1. Expand $\frac{x+4}{(x+1)^2}$ by partial fractions.

   (a) $\frac{1}{x+1} + \frac{x+3}{(x+1)^2}$

   (b) $\frac{2}{x+1} + \frac{x+2}{(x+1)^2}$

   (c) $\frac{3}{x+1} + \frac{x+1}{(x+1)^2}$

   (d) $\frac{4}{x+1} + \frac{x}{(x+1)^2}$

   (e) $\frac{1}{x+1} + \frac{3}{(x+1)^2}$

   (f) $\frac{3}{x+1}$

   (g) $\frac{3}{(x+1)^2}$

   (h) impossible since undefined at $x = -1$
2. Compute
\[ \int_2^4 \frac{2x^3 - 2x^2 - 1}{x^2 - x} \, dx. \]

(a) 12 + \ln(2/3).
(b) 16 + \ln(4).
(c) 16 + \ln(4) + \ln(3).
(d) 16 + \ln(4/3).
(e) 16 + \ln(3/4).
(f) \infty.
(g) -\infty.
(h) \frac{3}{2}.
3. Which term does NOT appear in the partial fractions expansion of
\[
\frac{x^8 + 3x^7 - 20x^5 + 13x^3 - x^2 + x - 7}{x^2(x + 1)^4(x^4 - 1)}
\]

(a) \( \frac{A}{x^2} \)
(b) \( \frac{B}{(x+1)^4} \)
(c) \( \frac{C}{(x+1)^5} \)
(d) \( \frac{D}{x} \)
(e) \( \frac{Ex+F}{x^2+1} \)
(f) \( \frac{Gx+H}{x^2-1} \)
(g) \( \frac{J}{x+1} \)
(h) \( \frac{K}{(x+1)^3} \)
4. Use the Trapezoidal Rule with \( n = 4 \) to approximate 
\[ \int_{0}^{2} \sqrt{x^2 + x} \, dx. \]

(a) 0.41  
(b) 0.86  
(c) 1.27  
(d) 1.55  
(e) 2.31  
(f) 2.72  
(g) 3.33  
(h) 3.54
5. Use Simpson’s Rule with $n = 4$ to approximate $\int_0^2 \sqrt{x^2 + x} \, dx$.

(a) 0.86
(b) 1.32
(c) 2.75
(d) 3.38
(e) 3.45
(f) 3.54
(g) 4.27
(h) 4.34
6. Find the minimum number of subintervals needed to approximate \( \int_{0}^{1} e^{x^2} \, dx \) with an error less than \( 10^{-4} \), when using the Trapezoidal Rule.

(a) 4
(b) 50
(c) 63
(d) 117
(e) 189
(f) 224
(g) 451
(h) 1003
7. Evaluate \( \int_{1}^{\infty} x^{-11/10} \, dx \).

(a) 2
(b) 10
(c) 25
(d) 110
(e) 1100
(f) 1250
(g) \( \infty \)
(h) \( -\infty \)
8. Evaluate
\[ \int_2^\infty \frac{1}{\ln(x)} \, dx \]

(a) Converges, by direct comparison with comparison function \( \frac{1}{x^2} \).

(b) Diverges, by direct comparison with the comparison function \( \frac{1}{x^2} \).

(c) Converges, by direct comparison with the comparison function \( e^x \).

(d) Diverges, by direct comparison with the comparison function \( e^x \).

(e) Converges, by direct comparison with the comparison function \( \frac{1}{x} \).

(f) Diverges, by direct comparison with the comparison function \( \frac{1}{x} \).

(g) Converges, by direct comparison with the comparison function \( e^{-x} \).

(h) Diverges, by direct comparison with the comparison function \( e^{-x} \).
9. Evaluate

\[ \int_{1}^{\infty} \frac{dx}{\sqrt{e^{2x} - x^2}} \]

(a) Converges, by limit comparison with the comparison function \( \frac{1}{x} \).

(b) Diverges, by limit comparison with the comparison function \( \frac{1}{x} \).

(c) Converges, by limit comparison with the comparison function \( \frac{1}{e^x} \).

(d) Diverges, by limit comparison with the comparison function \( \frac{1}{e^x} \).

(e) Converges, by direct comparison with comparison function \( \frac{1}{x} \).

(f) Diverges, by direct comparison with the comparison function \( \frac{1}{x} \).

(g) Converges, by direct comparison with the comparison function \( \frac{1}{e^x} \).

(h) Diverges, by direct comparison with the comparison function \( \frac{1}{e^x} \).
10. Evaluate \[ \int_{0}^{2} \frac{dx}{x - 1} \]

(a) Diverges to \( \infty \).
(b) Diverges to \(-\infty\).
(c) Diverges but not to \(-\infty\) or \(\infty\).
(d) 0
(e) 1
(f) \(-1\)
(g) 2
(h) \(-2\)
11. The region between the curve \( y = 2\sqrt{x}, \ 0 \leq x \leq 1, \) and the \( x \)-axis is revolved about the \( x \)-axis to generate a solid. Compute the volume of this solid.

(a) \( \pi/2 \)
(b) \( \pi \)
(c) \( 2\pi \)
(d) \( 5\pi/2 \)
(e) \( 5\pi \)
(f) \( \pi^2 \)
(g) \( \pi^2/2 \)
(h) \( 16\pi/15 \)
12. Find the volume of the solid generated by revolving the region bounded by \( y = |x| \) and \( y = 1 \) about the \( x \)-axis.

(a) \( \frac{4\pi}{3} \)
(b) \( \pi \)
(c) \( 2\pi \)
(d) \( \frac{5\pi}{2} \)
(e) \( 5\pi \)
(f) \( \pi^2 \)
(g) \( \frac{\pi^2}{2} \)
(h) 6.3
13. Find the volume of the solid generated by revolving the region between \( x = y^2 + 1 \) and the line \( x = 2 \) about the line \( x = 2 \).

(a) \( \pi/2 \)
(b) \( \pi \)
(c) \( 2\pi \)
(d) \( 5\pi/2 \)
(e) \( 5\pi \)
(f) \( \pi^2 \)
(g) \( \pi^2/2 \)
(h) \( 16\pi/15 \)
14. Find the length of the curve given by

\[ y = \frac{x^{3/2}}{2}, \quad 0 \leq x \leq \frac{4}{3} \]

(a) \( \frac{2}{3} \)
(b) \( \frac{4}{3} \)
(c) \( \frac{8}{3} \)
(d) \( \frac{8}{27} \)
(e) \( \frac{9}{4} \)
(f) \( \frac{13}{4} \)
(g) \( \frac{56}{27} \)
(h) \( \frac{128}{27} \)
15. Use the shell method to find the volume of the solid generated by revolving the region bounded by
\[ y = 1 + \frac{x^2}{4}, \quad 0 \leq x \leq 1, \] and the \( x \)-axis about the line \( x = -1 \).
16. Find the length of the curve given by

\[ x = \cos^3 t, \quad y = \sin^3 t, \quad 0 \leq t \leq \pi/2 \]
Name: 

Student ID: 19