Instructions

- Turn off all cell phones and watch alarms!
  Put away cell phones, iPods, etc.

- There are nine (9) questions.

- Do all work in this exam booklet. You may continue work to the backs of
  pages and the blank page at the end, but if you do so indicate where.

- Do not use a calculator; do not use any “cheat sheet” or other paper.

- Organize your work in an unambiguous order. Show all necessary steps.

- Answers given without supporting work may receive 0 credit!

- Be prepared to show your UMass ID card when you hand in your exam booklet.

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<th>QUESTION</th>
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1. (10%) Evaluate:

\[ \int \left( \sqrt{x} + e^x + 3 \sec^2 x \right) \, dx \]
2. (11%) Evaluate:
\[ \int \frac{\sin x}{1 + \cos^2 x} \, dx \]
3. (11%) Evaluate:
\[ \int \frac{\ln(\ln x)}{x} \, dx \]
4. (11%) Evaluate:
\[ \int x^2 \cos x \, dx \]
5. (11%) Evaluate:

\[
\int \frac{3x - 1}{\sqrt{9 - x^2}} \, dx
\]
6. (11%) Evaluate:

\[
\int \frac{\tan^3 x}{\cos x} \, dx
\]
7. (11%) Evaluate:
\[ \int \frac{x - 1}{x^2 - x - 2} \, dx \]
8. \((2 \times 6\% = 12\%)\) Determine whether each improper integral converges and, if it does, find its value.

(a) \(\int_0^\infty x e^{-x^2} \, dx\)

(b) \(\int_{-2}^1 \frac{1}{(x - 1)^3} \, dx\)
9. (2 × 6% = 12%) Determine whether each sequence \( \{a_n\}_{n=1}^{\infty} \) converges and, if it does, find its limit.

(a) \( a_n = \frac{6n - 2}{5n + 1} \)

(b) \( a_n = \frac{4 + (-1)^n}{n^3 + 1} \)
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