7. [13 points] Consider the following improper integrals. Show all your work to receive full credit.

a. [5 points] Determine the convergence or divergence of the following improper integral. If the integral converges, compute its value.

\[
\int_0^\frac{\pi}{2} \frac{\cos x}{\sqrt{\sin x}} \, dx
\]

Determine the convergence or divergence of the following improper integrals. Circle your answers.

b. [4 points] \[
\int_2^\infty \frac{5 - 3 \sin(2x)}{x^2} \, dx
\]

Converges Diverges

c. [4 points] \[
\int_1^\infty \frac{1}{x} \sqrt{a^2 + \frac{1}{\sqrt{x}}} \, dx
\]

where \(a\) is a positive constant.

Converges Diverges