

5. [7 points]

Determine whether the following improper integral converges or diverges and circle the corresponding word. **Fully justify** your answer including using **proper notation** and showing mechanics of any tests you use. You do not need to calculate the value of the integral if it converges.

$$\int_2^{\infty} \frac{10 + 3 \cos(x^2)}{x^{1/2} + x^{3/2}} dx$$

Circle one:

Converges

Diverges

Solution: On the interval $x \geq 2$, we have $\frac{10 + 3 \cos(x^2)}{x^{1/2} + x^{3/2}} \leq \frac{13}{x^{3/2}}$, and $\int_2^{\infty} \frac{13}{x^{3/2}} dx$ converges by the p -test with $p = \frac{3}{2}$. Therefore, by the (Direct) Comparison Test, $\int_2^{\infty} \frac{10 + 3 \cos(x^2)}{x^{1/2} + x^{3/2}} dx$ converges.