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1. Decide whether or not the following integrals converge or diverge. If they converge, find their

(a)
$$\int_{-\infty}^{0} \frac{1}{dx} dx$$

(a)
$$\int_{-\infty}^{0} \frac{1}{\sqrt{3-x}} dx$$

$$=\int_{-\infty}^{\infty} (3-x)^{1/2} dx$$

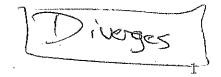
(b)
$$\int_{-\infty}^{\infty} x e^{-x^2} dx = \int_{-\infty}^{\infty} x e^{-x^2} dx + \int_{0}^{\infty} x e^{-x^2} dx$$

So
$$\int_{-\infty}^{\infty} xe^{-x^2} dx = -\frac{1}{2} + \frac{1}{2} = [0]$$
 [converges]

(c)
$$\int_0^\infty \sin(x) dx$$

(d)
$$\int_{-\infty}^{\infty} \frac{1}{x^4} dx \times \pm 0$$

$$= \int_{-\infty}^{-1} \frac{dx}{x^4} + \int_{-1}^{0} \frac{dx}{x^4} + \int_{0}^{1} \frac{dx}{x^4} + \int_{0}^{\infty} \frac{dx}{x^4} + \int_$$



(a)
$$\int \sin^5(x) \cos^9(x) dx$$
 $U = \sin x$ $\int u = \cos x dx$
 $= \int \sin^5(x) (\cos^3(x))^4 (\cos x) dx = \int \sin^5 x (1-\sin^2 x)^4 (\cos x) dx$
 $= \int u^5 (1-u^2)^4 du = \int u^{13} - 4u^4 + 6u^9 - 4u^7 + 4u^5 du$
 $= \frac{u^{14}}{4} - \frac{u^{12}}{3} + \frac{3u^{10}}{5} - \frac{u^8}{6} + \frac{u^6}{6} + C$
 $= \int \frac{\sin^4 x}{4} - \frac{\sin^{12} x}{3} + \frac{3\sin^{12} x}{5} - \frac{\sin^8 x}{5} + \frac{\sin^6 x}{6} + \frac{1}{6}$

(b) $\int \cos^4(x) \sin^2(x) dx$
 $= \int \cos^4(x) (1-\cos^2 x) dx = \int (\cos^4 x - \cos^2 x) dx$
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 $= \int \cos^4(x) (1-\cos^2 x) dx$
 $= \int \cos^4(x) (1-\cos^2(x)) \cos^6(x) dx$
 $= \int \cot^4(x) (1-\cos^4(x)) \cos^6(x) dx$
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 $= \int \cot^4(x) (1-$

3. Evaluate the indefinite integral
$$\int \frac{2x-1}{x^2-2x+3} dx$$
, by eventually using the trig sub: $u = \sqrt{2} \tan(\theta)$. Complete $\int \frac{2x-1}{x^2-2x+3} dx = \int \frac{2x-1}{(x-1)^2+2} dx =$

$$= \int \frac{2u+2-1}{u^2+2} du = \int \frac{2u}{u^2+2} du + \int \frac{1}{u^2+2} du$$

We will solve these integrals separately

work on next page &

First
$$V = u^{2} + \chi \implies dv = 2udv$$

Integral $\int 2u \ du = \int dv = \ln |v| = \ln |u|^{2} + \chi$

Second $U = \sqrt{\lambda} \chi + 2 = \sqrt{\lambda} \chi$