Math 2250 — Worksheet 20221031

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Problem 1. Determine limits. (L'Hopital works for some limits but may not work for others)

(1) $\lim_{x\to 2} \frac{x^2-4}{x^{1/3}-8}$

(2) $\lim_{x\to \pi} \frac{\cos x+1}{\sqrt{x}-\sqrt{\pi}}$

(3) $\lim_{x\to \pi/2} \frac{\sin x-1}{x-\pi}$

(4) $\lim_{x\to 0} \frac{\cos x-1}{x^2}$

(5) $\lim_{x\to \infty} \frac{x+\sin x}{x-\cos x}$

(6) $\lim_{x\to \infty} \frac{\ln x}{\ln(\ln x)}$

(7) $\lim_{x\to 0^+} x\ln x$

(Hint: This is $0\cdot\infty$ type. Rewrite as $\frac{\ln x}{\frac{1}{x}}$ and apply l'Hopital)

(8) $\lim_{x\to \infty} x(\tan^{-1} x-\frac{\pi}{2})$

Problem 2. A cylinder-shaped container with top and bottom is made of paper. If its volume is 4m^3, what is the smallest possible amount of paper to use? (Given: volume of cylinder $V = \pi r^2 h$, side area of cylinder $S = 2\pi rh$)

Problem 3. A rectangle lies inside the region bounded by $x = 0, y = 0, 2x + y = 1$, and its sides are parallel to the coordinate axes. Find the largest possible area of the rectangle.