## Workshop Problems–November 2

- 1. (a) Suppose you know that  $f'(x) = (x-1)(x-2)^2(x-3)^3(x-4)^4(x-5)^5$ . What are the critical points of f? Which of them are local extrema, and what kind oflocal extrema are they?
  - (b) Suppose you know that  $g'(x) = x(x-1)^{2/3}(x-2)^{3/5}(x-3)^{4/7}$ . What are the critical points of g? Which of them are local extrema, and what kind of local extrema are they?

 $2. \ {\rm Set}$ 

$$f(x) = \frac{x^2 - 1}{x^2 - 2}$$

- (a) Find the domain of this function. Then, compute the first and the second derivatives and find the intervals where the function increases, decreases, is concave up, and is concave down.
- (b) Find all the local extrema and inflection points.
- 3. Find the following limits.
  - (a)  $\lim_{x \to -3} \frac{xe^x 6 + 3e^x 3x}{1 + x\sin \pi x + x/3 + 3\sin \pi x}$
  - (b)  $\lim_{x \to 0^+} (\csc x)^{(\cos^{-1} x)/\ln x}$  (Here  $\cos^{-1} x = \arccos x$ )
  - (c)  $\lim_{x\to\infty} \left(1+\frac{a}{x}\right)^x$ , where *a* is a fixed real number.