MATH 205 – Calculus I **SQ 4.1**

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Instructions: Though calculators can be used for the entire daily question, all problems require you to show your work. Any answer without proper justification will receive ***ZERO*** credit. Only **EXACT** answers will receive full credit unless otherwise noted.

1. Given $g(x)=\frac{1}{4}x^4+\frac{1}{3}x^3-4x^2-12x+7$ on [-4, 5], determine

a) The critical points

$g'(x)=x^3+x^2-8x-12$

$g'(x)$ is never undefined

$0=x^3+x^2-8x-12$

$0=(x^2-x-6)(x+2)$

$0=(x-3)(x+2)(x+2)$

$x=3,-2$

Crit Pnts at $x=3$ and $x=-2$

$\frac{1}{4}(3)^4+\frac{1}{3}(3)^3-4(3)^2-12(3)+7$

$\frac{81}{4}+9-36-29$

$-35\frac{3}{4}$

$\frac{(-2)^4}{4}+\frac{(-2)^3}{3}-4(-2)^2-12(-2)+7$

$4-8/3-16+24+7=16\frac{1}{3}$

b) The local extrema values and where they occur

local min of $-35\frac{3}{4}$ at $x=3$

local max of $16\frac{1}{3}$ at $x=-2$

local max of $33^2/_3$ at $x=-4$

c) The absolute extrema values and where they occur

$\frac{(-4)^4}{4}+\frac{(-4)^3}{3}-4(-4)^2-12(-4)+7$

$64-21\frac{1}{3}-64+48+7$

$33^2/_3$

$\frac{5^4}{4}+\frac{5^3}{3}-4(5)^2-12(5)+7$

$156\frac{1}{4}+41\frac{2}{3}-100-60+7$

$44\frac{11}{12}$

absolute max of $44\frac{11}{12}$ at $x=5$

absolute min of $-35\frac{3}{4}$ at $x=3$

2. Given $h(x) = \frac{\ln x}{x}$, determine $x \neq 0$

a) The critical points

$h'(x) = \frac{x}{x} - \ln x$

$h'(x) = \frac{1 - \ln x}{x^2}$

$0 = 1 - \ln x$

$1 = \ln x$

$x = e$

$h'(x)$ undef $x = 0$

Critical point at $x = e$

$\cancel{x = 0}$

b) The local extrema values and where they occur

Local max of $\frac{1}{e}$ at $x = e$

No local min

c) The absolute extrema values and where they occur

absolute max of $\frac{1}{e}$ at $x = e$

No absolute min