Key

TMATH 124 Quiz 4

Show *all* your work (numerically, algebraically, or geometrically) for each and simplify. No credit is given without supporting work.

1. [3] (extreme wks #1) Draw the graph graph~~s~~ of ~~two~~ function~~s~~ f so that:

   +.5 (a) f is continuous on $[-3, 4)$

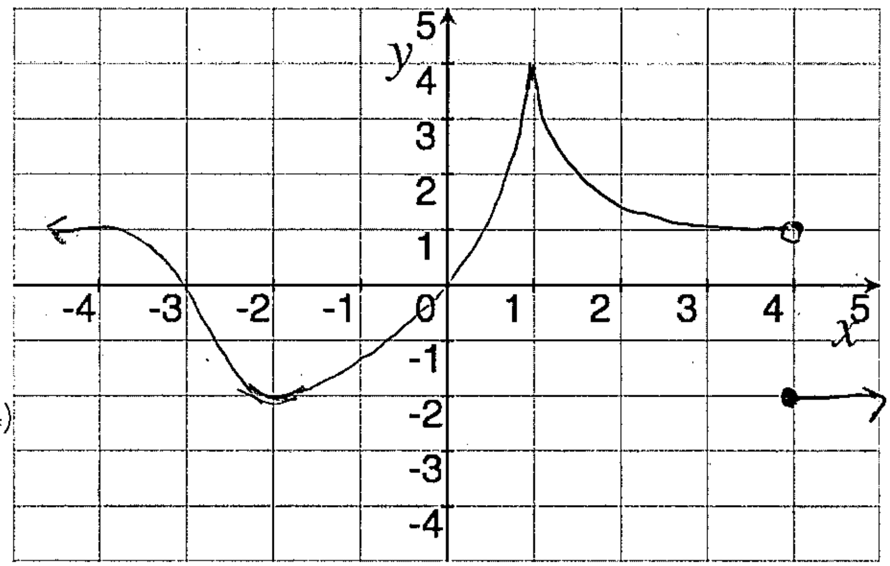
   +.5 (b) f has a local min when $x = -2$

   +.5 (c) $f'(-2) = 0$

   +.5 (d) f has a global max when $x = 1$

   +.5 (e) $f'(1)$ is not defined.

   +.5 (f) $\lim_{x\to 4} f(x) \neq f(4)$



one of many right answers. . .

2. Consider the function $g(x) = \ln(x^2 + x + 1)$ for the following questions.

(a) [1] Find $g'(x)$. Chain rule (+.5)

inside: x^2+x+1
outside: $\ln u$

$$g'(x) = \frac{1}{x^2+x+1} \cdot (2x+1)$$

$$= \frac{2x+1}{x^2+x+1}$$ (+.5)

(b) [2] (WebHW12 #7) Find the equation of the line tangent to g when $x = 1$.

looking for $y = mx + b$

$m =$ slope of line tangent to g when $x=1$ $= g'(1)$

(+.5) $= \frac{2(1)+1}{(1)^2+(1)+1} = \frac{3}{3} = 1$

(+.5) passes thru $(1, g(1))$
$= (1, \ln(1^2+1+1))$
$= (1, \ln 3)$

(+.5) so $\ln 3 = 1(1) + b$
$\Rightarrow b = (\ln 3) - 1$

(+.5) So $y = 1x + (\ln 3 - 1)$

(c) [4] (§4.1 #67) Use calculus to find the local minimum value(s) of g.

(+.5) Recall all local extrema are critical points

Finding critical points:

(+.5) $g'(x) = 0$:

$$\frac{2x+1}{x^2+x+1} = 0$$

alg (+1) $\Rightarrow 2x+1 = 0$

$\Rightarrow x = -\frac{1}{2}$

$g'(x)$ DNE:
denominator $= 0$
$x^2+x+1 = 0$
never happens

Critical Points: $x = -\frac{1}{2}$

(+.5) figure out if this is a min

Method A:

(+1) neg ↘ $-\frac{1}{2}$ ↗ pos

$\frac{2(-1)+1}{(-1)^2+(-1)+1} = -1$ $\qquad$ $\frac{2 \cdot 0+1}{0^2+0+1} = 1$

(+.5) so g has a minimum at
$(-\frac{1}{2}, g(-\frac{1}{2}))$
$(-\frac{1}{2}, \ln(\frac{1}{4} - \frac{1}{2} + 1))$