MATH 141: Quiz 6

Name: key

Directions:

- Show your thought process (commonly said as "show your work") when solving each problem for full credit.
- If you do not know how to solve a problem, try your best and/or explain in English what you would do.
- Good luck!

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1. If a circle is expanding over time, how fast is the area increasing when the radius is 4 cm and the radius is increasing at $\frac{1}{\pi}$ centimeters per second?

(1) A - area of circle

r - radius of circle

(2) $r = 4$ cm want: $\frac{dA}{dt}$

$\frac{dr}{dt} = \frac{1}{\pi}$ cm/s

(3) $A = \pi r^2$

(4) $\frac{d}{dt}[A] = \frac{d}{dt}[\pi r^2]$

$\frac{dA}{dt} = \pi \cdot \frac{d}{dt}[r^2]$

$\frac{dA}{dt} = \pi \cdot 2r \cdot \frac{dr}{dt}$

(6) $\frac{dA}{dt} = \pi \cdot 2 \cdot (4\text{ cm}) \cdot \frac{1}{\pi}$ cm/s $= \boxed{8 \text{ cm}^2/\text{s}}$

2. Find the critical numbers of the function

quotient rule

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

$$f'(x) = 1 + \frac{(x-1)\cdot\frac{d}{dx}[2-x] - (2-x)\cdot\frac{d}{dx}[x-1]}{(x-1)^2}$$

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

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

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

remember to put into one fraction!

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

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

(a) solve $f'(x) = 0$

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

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

$x = 0, 2$

(b) find where $f'(x)$ DNE.

Set denom $= 0$.

$$(x-1)^2 = 0$$

$$x - 1 = 0$$

$x = 1$