Math 1431, Section 17699

EMCF 8 (10 points)

Due 3/25 at 11:59pm

Sol

Instructions:

- Submit this assignment at http://www.casa.uh.edu under "EMCF" and choose EMCF 8.

1. If $f'(x) < 0$ for all x on the interval I, then $f(x)$ is concave down on the interval I.
   a. True
   b. False

   ↘ Decreasing

2. A point that has an x-coordinate where $f''(x) = 0$ is a point of inflection.
   a. True
   b. False

   True

3. The largest open interval over which f is concave up for $f(x) = \sqrt[5]{x-7}$ is
   a. $(-\infty, 7)$
   b. $(7, \infty)$
   c. $(-\infty, \infty)$
   d. nowhere
   e. $(-7, 7)$
   f. None of the above.

   $(x-7)^{\frac{1}{5}}$

   $f'(x) = \frac{1}{5}(x-7)^{-\frac{4}{5}}$

   $f''(x) = -\frac{4}{25}(x-7)^{-\frac{9}{5}}$

   $f''(x)$ DNE $\Rightarrow x = 7$

   $D(f) = \mathbb{R}$

   $(-\infty, 7)$ up, $(7, \infty)$ down.

   $f''(x)$: ++++ | 7 | ----

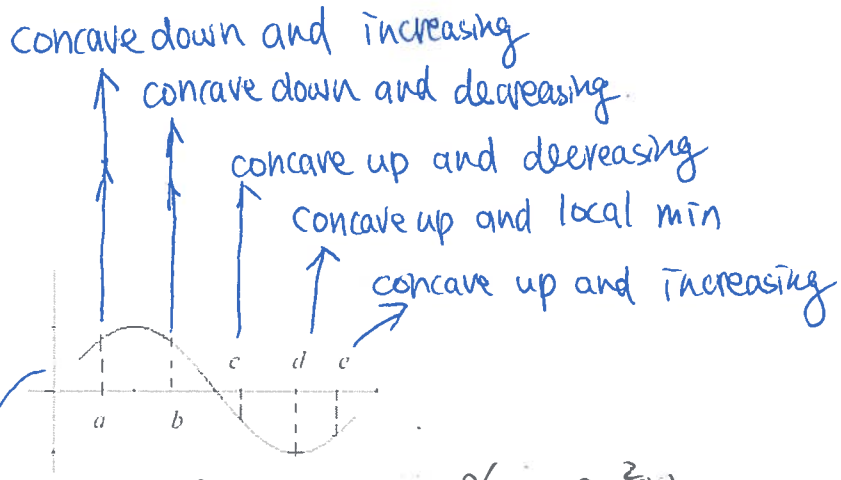
4. The function $f(x) = x^{5/7}$ has a point of inflection with an x-coordinate of
   a. 0
   b. $5/7$
   c. $-5/7$
   d. None exist.
   e. 1
   f. None of the above.

   $D(f) = \mathbb{R}$

   $f'(x) = \frac{5}{7}x^{-\frac{2}{7}}$, $f''(x) = -\frac{10}{49}x^{-\frac{9}{7}} = -\frac{10}{49}\frac{1}{x^{\frac{9}{7}}}$

   $f''(x) = 0$: NONE

   $f''(x)$ DNE: $x = 0$.



5. $f(x) = \tan(x)$ has a point of inflection on $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
   a. True
   b. False

   $D(f) = \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

   $f'(x) = \sec^2(x)$.

   $f''(x) = 2\sec(x)\cdot\sec(x)\tan(x) = 2\sec^2(x)\tan(x) = \frac{2\sin(x)}{\cos^3(x)} = 0$

   $\Leftrightarrow x = 0$

   $(0, 0)$ is a point of inflection.

6. $f(x) = x^5 - 2x^3 + x$ has a point of inflection.
   a. True
   b. False

   $f'(x) = 5x^4 - 6x^2 + 1$

   $f''(x) = 20x^3 - 12x = 4x(5x^2 - 3) = 0$. $x = 0, \pm\sqrt{\frac{3}{5}}$ (point of inflection)

7. The function $f(x) = x^5 - 1$ is concave down on
   a. $(-\infty, 2)$
   b. $(2, \infty)$
   c. $(-\infty, 0)$
   d. $(0, \infty)$
   e. $(-\infty, \infty)$
   f. None of the above.

   $f'(x) = 5x^4$

   $f''(x) = 20x^3 \Rightarrow x = 0$ (point of inflection)

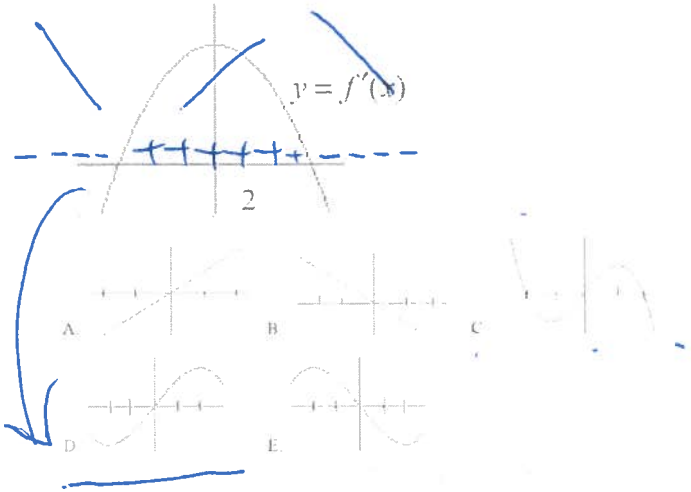
   concave

   $f''(x)$: down | 0 | up

   ---- | 0 | ++++

8. The graph of $y = f(x)$ is at the top of the page. For which of the five domain values shown is $f''(x) > 0$ and $f'(x) < 0$?
   a. a
   b. b
   c. c
   d. d
   e. e
   f. None of the above.

   concave up and decreasing.



9. The graph of the derivative of f is shown above. Which of the graphs above could be the graph of f?

10. Let $f(x)$ be a polynomial function such that $f(7) = -4$, $f'(7) = 0$, and $f''(7) = 3$. The point $(7, -4)$ is a _____ on the graph of $f(x)$.

    a. relative maximum
    b. relative minimum
    c. inflection point
    d. intercept
    e. None of these.

↓ extrema ↓ $f''(7) > 0 \Rightarrow$ local min.