Math 1431, Section 17699

EMCF 9 (10 points)

Due 3/28 at 11:59pm

lol

Instructions:

- Submit this assignment at http://www.casa.uh.edu under "EMCF" and choose EMCF 9.

1. The function $f(x) = -2x + 3$ is invertible. Give $f^{-1}(3)$. Let $x = f^{-1}(3) \Rightarrow f(x) = 3$.

   That is, find a "x" such that $f(x) = 3$.

   $-2x + 3 = 3 \Rightarrow x = 0$.

   a. -1
   b. 0
   c. 1/2
   d. 1
   e. None of the above.

2. The function $f(x) = x^3 + x$ is invertible. Give the slope of the tangent line to the graph of $f^{-1}(x)$ at $x = 2$.

   If f is invertible, $(f^{-1})'(b) = \frac{1}{f'(a)}$ for $f(a) = b$.

   at $x = 2$, $(f^{-1}(x))'\Big|_{x=2} = \frac{1}{f'(x)}\Big|_{x=2} = \frac{1}{3x^2+1}\Big|_{x=2} = \frac{1}{13}$

   a. $-1/2$
   b. 1/13
   c. 1/2
   d. 1/4
   e. 2
   f. None of the above.

3. The function $f(x) = x^3 + x$ is invertible. Give $f^{-1}(2)$. Let $x = f^{-1}(2) \Rightarrow f(x) = 2$

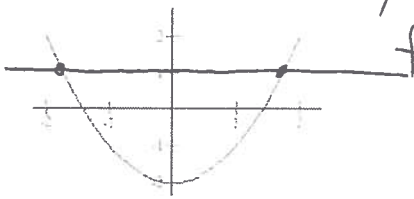
   $f(x) = x^3 + x = 2$

   $\Rightarrow x^3 + x - 2 = 0$

   $\Rightarrow (x-1)(x^2 + x + 2) = 0$

   $\Rightarrow x = 1$.

   a. -1
   b. $-1/2$
   c. 1/2
   d. 1
   e. 2
   f. None of the above.



by horizontal line Test,

f is NOT INVERTIBLE.

4. The graph of f is shown above. Determine whether f is invertible.

   a. The function is invertible
   b. The function is not invertible

5. The function $f(x) = -2x + 3$ is invertible. Give the slope of the tangent line to the graph of $f^{-1}(x)$ at $x = 2$.

   $(f^{-1})'(b) = \frac{1}{f'(x)}\Big|_{x=2} = \frac{1}{-2}\Big|_{x=2} = -\frac{1}{2}$

   a. -1
   b. $-1/2$
   c. 1/2
   d. 1
   e. 2
   f. None of the above.

6. Determine whether $f(x) = x^4 + 3x^3 + 1$ is invertible.

   $f'(x) = 4x^3 + 9x^2 = x^2(4x + 9)$

   $-\frac{9}{4}$ 0

   $\Rightarrow$ NOT monotone

   $\Rightarrow$ NOT invertible.

   a. The function is invertible
   b. The function is not invertible

7. The function $f(x) = x^5 + 3x^3 + x + 1$ is invertible. Give $(f^{-1})'(1)$.

   $(f^{-1})'(1) = \frac{1}{f'(a)} = \frac{1}{5x^4 + 9x^2 + 1}\Big|_{x=a}$

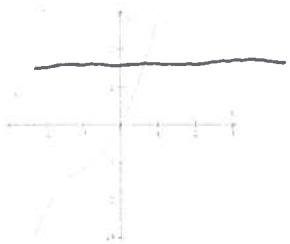
   $= \frac{1}{5x^4 + 9x^2 + 1}\Big|_{x=0} = \frac{1}{1} = 1$

   Find a such that $f(a) = 1$.

   $\Rightarrow a^5 + 3a^3 + a + 1 = 1$

   $\Rightarrow a = 0$

   a. -2
   b. -1
   c. 1/2
   d. 1
   e. 2
   f. None of the above.



By horizontal line test,
It is invertible.

8. The graph of f is shown above. Determine whether f is invertible.

   a. The function is invertible
   b. The function is not invertible

9. Suppose $(f^{-1})'(1) = 1/3$ and $f(3) = 1$. Give the slope of the tangent line to the graph of $f(x)$ at $x = 3$.

   $$\frac{1}{3} = (f^{-1})'(1) = \frac{1}{f'(3)} \Rightarrow f'(3) = 3.$$

   a. -3
   b. -2
   c. 1
   d. 2
   e. 3
   f. None of the above.

10. If f is invertible and $f(4) = 2$, $f'(4) = 3$. $f'(2) = 9$, find $(f^{-1})'(2)$.

    $$(f^{-1})'(2) = \frac{1}{f'(4)} = \frac{1}{3}.$$

    a. 1/9
    b. 1/4
    c. 1/3
    d. 1/2
    e. 1
    f. None of the above.