

11A PRACTICE
PROBLEMS for MIDTERM
MIGLIORE

1. Solve for x if $e^{2x+1} = 5$.
2. Solve for x if $\ln(x-1) = 3$.
3. Find the range of $f(x) = x^2 - 1$, $-2 < x \leq 1$.
4. Let $f(x) = x^2 - x$ and $g(x) = x - 1$. Find $(f \circ g)(x)$ and $(g \circ f)(x)$.

$$5. \lim_{x \rightarrow \infty} \frac{x^2}{2 - x^2}$$

$$9. \lim_{x \rightarrow \infty} \frac{e^x}{2 - e^x}$$

$$6. \lim_{x \rightarrow 3} \frac{x^2 - 9}{x^2 - 4x + 3}$$

$$10. \lim_{x \rightarrow 0} \frac{\sin^2 x}{x}$$

$$7. \lim_{x \rightarrow 0} \frac{\sqrt{3-x} - \sqrt{3}}{x}$$

$$11. \lim_{x \rightarrow 0} \frac{1 - \cos(2x)}{3x}$$

$$8. \lim_{x \rightarrow 0} \frac{e^{2x} + e^{-x}}{2 + e^x}$$

$$12. \text{ Let } f(x) = \begin{cases} \frac{x^2 + x - 2}{x - 1} & \text{if } x \neq 1 \\ a & \text{if } x = 1 \end{cases}. \text{ Which value must you assign to } a \text{ so that } f(x) \text{ is continuous at } a?$$

13. Let $f(x) = x^3 - 2x + 3$, $-3 \leq x \leq -1$. Use the Intermediate Value Theorem to show that $x^3 - 2x + 3 = 0$ has a solution in the interval $(-3, -1)$.

14. Suppose the sequence defined recursively by $a_1 = 1$ and for $n \geq 1$ $a_{n+1} = 1 + \frac{1}{a_n}$ has a limit and $\lim_{n \rightarrow \infty} a_n = A$.

Find the value for A .

15. Let $f(x) = [x]$, the greatest integer less than or equal to x . Find the following limits

$$a) \lim_{x \rightarrow 0^+} f(x)$$

$$b) \lim_{x \rightarrow 2.5} f(x)$$

$$c) \lim_{x \rightarrow 0} f(x)$$

16. Is $f(x)$ continuous at $a=1$? Why or why not?

$$f(x) = \begin{cases} \frac{x^2 - 1}{x - 1} & \text{if } x \neq 1 \\ 2 & \text{if } x = 1 \end{cases}$$

17. For what values of c is the function continuous for all Real numbers?

$$f(x) = \begin{cases} cx + 1 & \text{if } x \leq 3 \\ cx^2 - 1 & \text{if } x > 3 \end{cases}$$

18. Find all asymptotes of the graph of:

a) $y = \frac{2x}{x^2 - 9}$

b) $y = \frac{x^3 - x^2}{(x-1)(x+2)}$

19. Find the domain of:

a) $f(x) = \log\left(\frac{x^2 - 4}{x}\right)$

c) $h(x) = \frac{5}{e^{x+3} - 1}$

b) $g(x) = \frac{x}{\sqrt{4-x}}$

20. Find the inverse function, $f^{-1}(x)$, if:

a) $f(x) = 10e^{2x}$

b) $f(x) = \frac{x+2}{x-3}$

21. Let $f(x) = -x + 3$. Find $f[f(x)]$

22. Let $f(x) = 2^x$ and $g(x) = x + 2$. On the same set of axes sketch and label the graphs of $f[g(x)]$ and $g[f(x)]$.

23. Find the exponential function, $f(x) = Ca^x$ which best fits the data:

x	1	2	3
f(x)	4.5	13.5	40.5

24. Find the doubling time for the exponential function:

a) $P(t) = P_0 e^{.25t}$

b) $Q(t) = 11 \cdot 2^{.25t}$.

25. Find the angle, $\theta \in [0, 2\pi)$, such that:

a) $\sin \theta = -1/2$ and $\tan \theta = \sqrt{3}/3$

c) $\cos \theta < 0$ and $\sin \theta > 0$ and $\tan \theta = -1$

b) $\cos \theta = 1/2$ and $\sin \theta < 0$