

1. (10 pts) Given  $f(x)$  as shown below:

- a) Graph  $f(x+2)$ . (3 pts)
- b) Graph  $-2f(x)+3$ . (4 pts)
- c) Graph  $|f(x)|$ . (3 pts)

2. (10 pts) Given  $f(x) = \frac{1}{\sqrt{x-2}}$  and  $g(x) = x^2 - 1$ , find  $(f \circ g)(x)$  and its domain.

3. (10 pts) Given  $f(x) = \begin{cases} x^2 - 3 & \text{if } x \geq 2 \\ ax - 3 & \text{if } x < 2 \end{cases}$

For what value of  $a$  is  $f(x)$  continuous at all values of  $x$ ? (5 pts)

Why does this value of  $a$  make the function continuous everywhere? (5 pts)

4. (10 pts) Given  $f(x)$  as shown below:

a. Evaluate each limit if it exists. If it DNE, state clearly why.

$$\lim_{x \rightarrow 3} f(x) = \underline{\hspace{2cm}} \qquad \lim_{x \rightarrow 0^-} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow 0^+} f(x) = \underline{\hspace{2cm}} \qquad \lim_{x \rightarrow 4} f(x) = \underline{\hspace{2cm}}$$

5. (10 pts) Use **limit laws** to find the following limit if it exists, if it DNE clearly state why.

a.  $\lim_{x \rightarrow 3} \frac{x^2 + 2x - 15}{x^2 - x - 6}$       b.  $\lim_{h \rightarrow 0} \frac{\frac{4}{2+h} - 2}{h}$

6. (10 pts) Use **limit laws** to find the following limit if it exists, if it DNE clearly state why

a.  $\lim_{t \rightarrow 0} \frac{2t}{\sqrt{3} - \sqrt{3-t}}$       b.  $\lim_{x \rightarrow 0^+} \left( \frac{2}{x} - \frac{1}{|x|} \right)$

7. (10 pts) Given  $f(x) = \sqrt{x-1}$ . Use the graph below to find a  $\mathbf{d} > 0$  such that  $|\sqrt{x-1} - 2| < .5$  whenever  $0 < |x-5| < \mathbf{d}$  for the  $\lim_{x \rightarrow 5} (\sqrt{x-1}) = 2$ .  
 (Clearly label the graph with the epsilon and delta(s) you use).
8. (10 pts) Given that a mouse travels down the x-axis of life such that its distance from its birthplace in inches is given by  $s(t) = 3t^2 + 6t - 1$ , with t in hours, find the mouse's average velocity over the time interval  $t=2$  to  $t=4$  hours. Then find the instantaneous velocity when  $t=4$  hours.
9. (10 pts) Show, using the Intermediate Value Theorem (IVT), that  $f(x) = x^3 - 2$  and  $g(x) = \sqrt{x}$  have at least one intersection point. (If **you** can't do this problem, then clearly state the IVT for **3 points maximum**).
10. (10 pts) Find  $\lim_{x \rightarrow 0^+} \sqrt{x} \cos\left(\frac{2}{\sqrt{x}}\right)$ . Name any theorems you use.