MAC 2311 EXAM 1B **R^2** **NAME** ______________________________

Show all work on separate paper. Turn in ALL worksheets.

1. Graph $y = \sqrt{x}$. From this graph, sketch a) $y = \sqrt{x} + 2$; b) $y = -\sqrt{x}$; c) $y = \sqrt{-x}$; d) $y = \sqrt{x+4}$.

2. Test for symmetry (*x* axis, *y* axis, and origin) and give the *x* and *y* intercepts: $y = x^3 - 4x$.

3. Find the equation of the line joining the points of intersection of
$$y = x^2 - 4x + 3$$
$$y = -x^2 + 2x + 3$$

4. Find the domain and range for $f(x) = \dfrac{16}{x^2 - 4x}$.

   [Hint: Use a graphing calculator to find the range!]

5. Find the domain and range for $f(x) = \sqrt{x^2 - 3x - 4}$.

6. If $f(x) = \sqrt{x}$ **and** $g(x) = x^3 + 3x - 6$, find f (g(x)) and g(f(*x*)).

7. Graph: $f(x) = \begin{cases} 8 - 2x & \text{if } x > 2 \\ x + 2 & \text{if } x \le 2 \end{cases}$

8. Given: $f(x) = \begin{cases} 8 - 2x & \text{if } x > 2 \\ x + 2 & \text{if } x \le 2 \end{cases}$

   a) $\lim_{x \to 2^-} f(x)$ b) $\lim_{x \to 2^+} f(x)$ c) $\lim_{x \to 2} f(x)$

   d) Is this graph continuous? Explain your answer.

9. Given: $f(x) = \begin{cases} 2x - 8 & \text{if } x > 2 \\ x - 2 & \text{if } x \le 2 \end{cases}$

   a) $\lim_{x \to 2^-} f(x)$ b) $\lim_{x \to 2^+} f(x)$ c) $\lim_{x \to 2} f(x)$

   d) Is this graph continuous? Explain your answer.

10. Find $\lim_{x \to 3} \dfrac{x^2 - 9}{x^2 - 3x}$.

11. Find $\lim_{x \to -2} \dfrac{x^2 - 4}{x^3 + 8}$.

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12. Find $\lim\limits_{h\to 0} \dfrac{x^2h - xh^2 + h^3}{h}$.

13. Find $\lim\limits_{x\to 0} \dfrac{\sqrt{4+x} - 2}{x}$.

14. Find $\lim\limits_{\theta\to 0} \dfrac{\sin 3\theta}{\theta}$.

15. Given: $f(x) = \dfrac{|x|}{x}$

a) $\lim\limits_{x\to 0^-} f(x)$ b) $\lim\limits_{x\to 0^+} f(x)$ c) $\lim\limits_{x\to 0} f(x)$ d) Sketch the graph.

16. For $f(x) = 3x^2 - 5x + 2$, find a) $\dfrac{f(x+\Delta x) - f(x)}{\Delta x}$; b) $\lim\limits_{\Delta x\to 0} \dfrac{f(x+\Delta x) - f(x)}{\Delta x}$.

17. For what value(s) of c will the function

$$f(x) = \begin{cases} cx - 1 & \text{if } x < 4 \\ cx^2 & \text{if } x \ge 4 \end{cases}$$ be continuous.

18. Give all values for which the function is discontinuous. Distinguish whether points of discontinuity are removable or non-removable discontinuities.

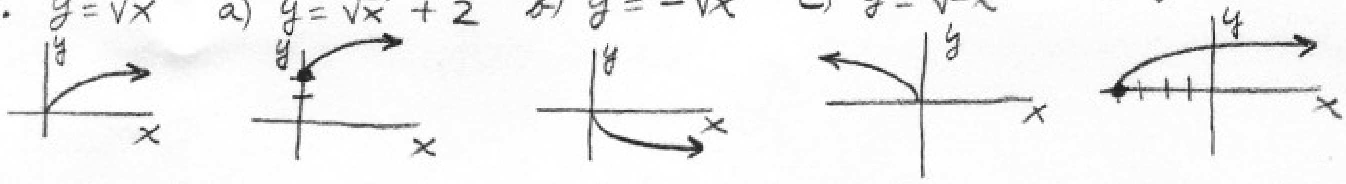
[Note: The graph will be posted soon!]

19. Use the function $f(x) = \dfrac{x+2}{x^2 - 2x - 8}$ to explain the difference between removable and non-removable discontinuities. Find all vertical asymptotes. Sketch the graph.

20. If $f(x) = \dfrac{1}{2}x + 4$, a=2, and ϵ = .02, find L, and find δ such that |f(x) – L| < ϵ for every x where 0 < |**x** – a| < δ.

MAC 2311 Calculus I EXAM 1B Solutions

1. $y=\sqrt{x}$ a) $y=\sqrt{x}+2$ b) $y=-\sqrt{x}$ c) $y=\sqrt{-x}$ d) $y=\sqrt{x+4}$



2. $y=x^3-4x$

x axis (use $-y$)

$-y=x^3-4x$ No!

y axis (use $-x$)

$y=(-x)^3-4(-x)$

$y=-x^3+4x$ No!

Origin (use $-x, -y$)

$-y=(-x)^3-4(-x)$

$-y=-x^3+4x$

$y=x^3-4x$ Yes

y int ($x=0$) $(0,0)$

x int: $y=0$

$0=x^3-4x$

$0=x(x^2-4)$

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

$x=0, 2, -2$

3. $y=x^2-4x+3$

$y=-x^2+2x+3$

$x^2-4x+3=-x^2+2x+3$

$2x^2-6x=0$

$2x(x-3)=0$

$x=0, \quad x=3$

$y=3 \quad y=9-12+3$

$y=0$

(Also, use calculator to find points of intersection!)

Intersection: $(0,3)$ $(3,0)$

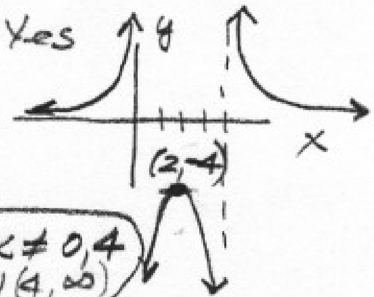
$m=\frac{3-0}{0-3}=-1$

y int $=3=b$

$y=mx+b$

$y=-x+3$

4. $y=\frac{16}{x^2-4x}$

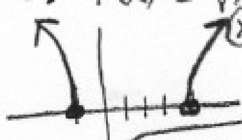


D: $x^2-4x\neq 0$

D: $x \neq$ all real $x\neq 0,4$ or $(-\infty,0)\cup(0,4)\cup(4,\infty)$

R: $(-\infty,-4]\cup(0,\infty)$

5. $f(x)=\sqrt{x^2-3x-4}$ $(x-4)(x+1)$



D: $(-\infty,-1]\cup[4,\infty)$

R: $[0,\infty)$

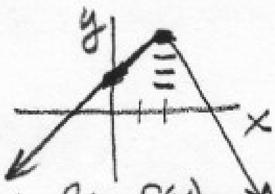
6. $f(x)=\sqrt{x}$ $g(x)=x^3+3x-6$

$f[g(x)]=\sqrt{x^3+3x-6}$

$g[f(x)]=(\sqrt{x})^3+3\sqrt{x}-6$

$=x^{3/2}+3x^{1/2}-6$

7. $f(x)=\begin{cases} 8-2x & \text{if } x>2 \\ x+2 & \text{if } x\leq 2. \end{cases}$



8 a) $\lim_{x\to 2^-}=4$ b) $\lim_{x\to 2^+}=4$ c) $\lim_{x\to 2} f(x)=4$

and $f(2)=4$.

d) Continuous yes! Because 1. $f(2)$ exists 2. $\lim_{x\to 2} f(x)$ exists 3. $\lim_{x\to 2} f(x)=f(2)$

9. $f(x)=\begin{cases} 2x-8 & \text{if } x>2 \\ x-2 & \text{if } x\leq 2 \end{cases}$

a) $\lim_{x\to 2^-}=0$ b) $\lim_{x\to 2^+}=-4$

c) $\lim_{x\to 2}$ DNE d) Disco!

$\lim_{x\to 2}$ DNE!

10. $\lim_{x\to 3}\frac{(x-3)(x+3)}{x(x-3)}$

$=\frac{6}{3}=2$

11. $\lim_{x\to -2}\frac{x^2-4}{x^3+8}$

$\lim_{x\to -2}\frac{(x-2)(x+2)}{(x+2)(x^2-2x+4)}=\frac{-4}{4+4+4}$

$=\frac{-4}{12}=-\frac{1}{3}$

12. $\lim_{h\to 0}\frac{x^2h-xh^2+h^3}{h}$

$=\lim_{h\to 0}\frac{h(x^2-xh+h^2)}{h}$

x^2

13. $\lim_{x\to 0}\frac{(\sqrt{4+x}-2)}{x}\frac{(\sqrt{4+x}+2)}{\sqrt{4+x}+2}$

$\lim_{x\to 0}\frac{4+x-4}{x(\sqrt{4+x}+2)}$

$\lim_{x\to 0}\frac{x}{x(\sqrt{4+x}+2)}$

$\lim_{x\to 0}\frac{1}{\sqrt{4}+2}=\frac{1}{4}$

14. $\lim_{\theta\to 0}\frac{\sin 3\theta}{\theta}$

$\lim_{\theta\to 0} 3\left(\frac{\sin 3\theta}{3\theta}\right)^{1}$

$=3$