

# MAT 136: Calculus I

## Weekly Homework 3

NAME: \_\_\_\_\_

### Instructions

Complete each of the following exercises. Your solutions should be complete and neatly written. In particular, you should show all of your work. Write your solutions on your own paper or prepare them digitally. You will need to capture your work digitally and then upload a single PDF document (possibly with multiple pages) to BbLearn. There are many free smartphone apps for doing this. I use TurboScan on my iPhone. This assignment is due on **Wednesday, September 2 by 8:00pm.**

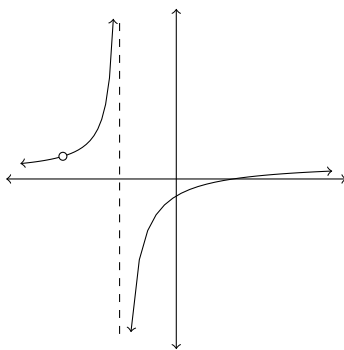
### Problems

1. Let  $a, b, c, d$  be distinct real numbers and let  $k$  be a real number. Match each function with the only possible correct graph.

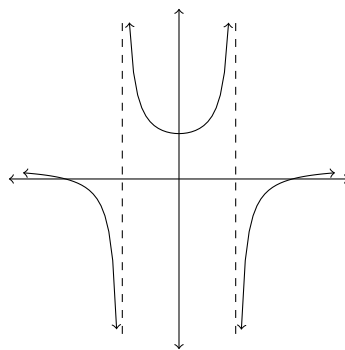
(a)  $f(x) = \frac{k(x-a)(x-b)}{(x-a)(x-b)}$       Graph: \_\_\_\_\_

(b)  $g(x) = \frac{k(x-a)(x-b)}{(x-a)(x-c)}$       Graph: \_\_\_\_\_

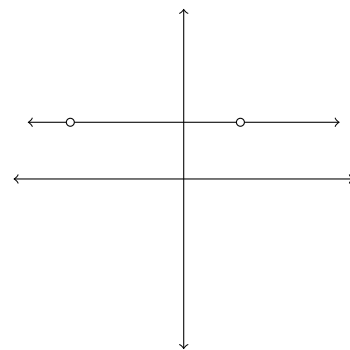
(c)  $h(x) = \frac{k(x-a)(x-b)}{(x-c)(x-d)}$       Graph: \_\_\_\_\_



(a) Graph A



(b) Graph B



(c) Graph C

2. Determine whether the following inequalities provide sufficient information to determine  $\lim_{x \rightarrow 1} f(x)$ , and if so, find the limit. If there is not sufficient information, explain why.

(a)  $2x - 1 \leq f(x) \leq x^2$

(b)  $4x - x^2 \leq f(x) \leq x^2 + 2.$

3. Use the Squeeze Theorem to evaluate the following limits. You should show sufficient justification.

(a)  $\lim_{x \rightarrow 0} x^2 \cos\left(\frac{1}{42x}\right)$

(b)  $\lim_{x \rightarrow 1} (x - 1) \sin\left(\frac{\pi}{x - 1}\right)$

4. Evaluate each of the following limits. If a limit does not exist, write DNE. Sufficient work must be shown and proper notation should be used. In particular, you should write limits where appropriate. Give *exact answers*.

(a)  $\lim_{x \rightarrow 0} \frac{\sin^2(x)}{x}$

(b)  $\lim_{x \rightarrow 0} \frac{\sin(13x)}{4x}$

(c)  $\lim_{x \rightarrow 0} \frac{\sin(13x)}{\sin(4x)}$

(d)  $\lim_{x \rightarrow 0} \frac{\tan(x)}{x}$

(e) Oops! Originally had a duplicate here.

(f)  $\lim_{x \rightarrow 0} \frac{\sec(x) - 1}{x}$

(g)  $\lim_{x \rightarrow \pi/2} \frac{\cos(x) - 1}{x}$

(h)  $\lim_{x \rightarrow 0} \frac{1 - \cos(x)}{\sin(x)}$

(i)  $\lim_{x \rightarrow \infty} \frac{2x^2 + 6x}{9 - x^2}$

(j)  $\lim_{x \rightarrow -\infty} \frac{2x^2 + 6x}{9 - x^2}$

(k)  $\lim_{w \rightarrow -\infty} \frac{4w^3 - w + 3}{5 + w - 3w^2}$

(l)  $\lim_{w \rightarrow -\infty} \frac{4w^2 - w + 3}{5 + w - 3w^3}$

(m)  $\lim_{x \rightarrow \infty} \frac{\sqrt{36x^4 + 7}}{9x^2 + 4}$

(n)  $\lim_{x \rightarrow \infty} \frac{\sqrt{x^3 + 20x}}{10x - 2}$

(o)  $\lim_{x \rightarrow \infty} (\sqrt{x^2 + 1} - x)$

(p)  $\lim_{x \rightarrow \infty} \arctan(x)$