

*University of Lethbridge*  
Department of Mathematics and Computer Science  
19<sup>th</sup> November, 2015, 10:00 - 10:50 am  
**MATH 1010A - Test #2 Alternate**

Last Name: \_\_\_\_\_

First Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

Tutorial Section: \_\_\_\_\_

**Record your answers below each question in the space provided. Left-hand pages may be used as scrap paper for rough work. If you want any work on the left-hand pages to be graded, please indicate so on the right-hand page.**

**Partial credit will be awarded for partially correct work, so be sure to show your work, and include all necessary justifications needed to support your arguments.**

**No external aids are allowed, with the exception of a 5-function calculator.**

For grader's use only:

Problem	Grade
1	/8
2	/12
3	/10
4	/10
Total	/40

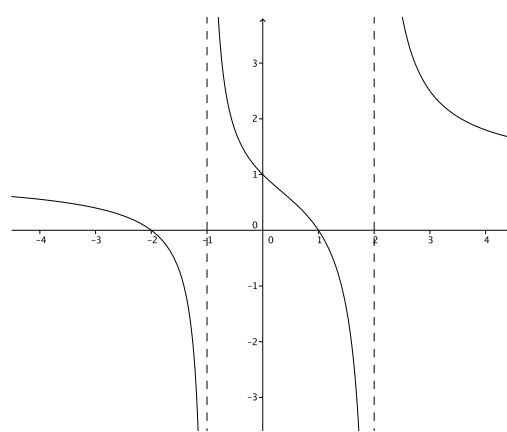
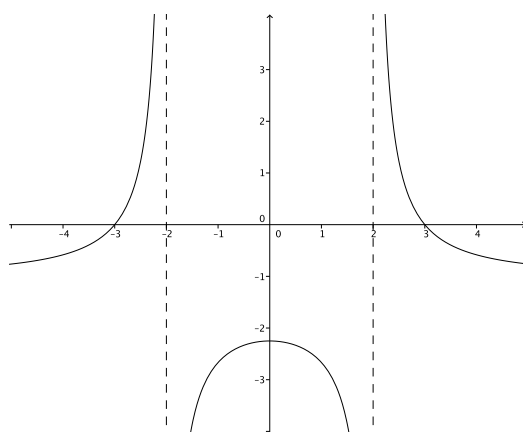
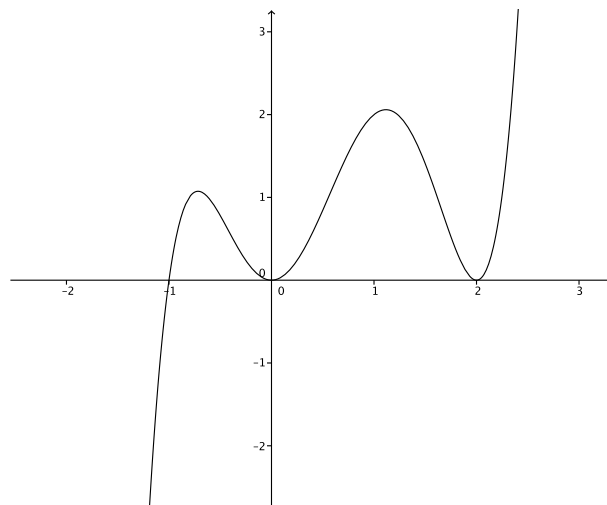
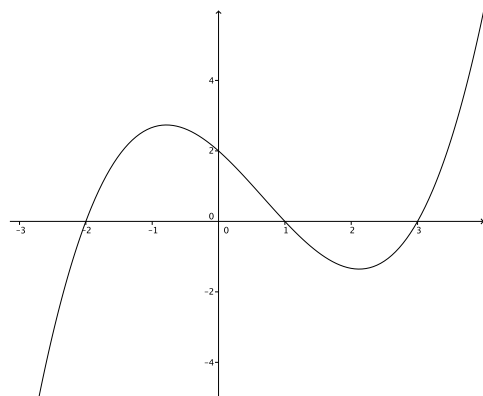
- [8] 1. Match the following functions with their graphs below:

$$f(x) = x^2(x+1)(x-2)^2,$$

$$h(x) = \frac{(x+2)(x-1)}{(x+1)(x-2)},$$

$$g(x) = \frac{1}{3}(x+2)(x-1)(x-3),$$

$$k(x) = \frac{9-x^2}{x^2-4}$$



2. Let  $f(x) = x^3 - 3x^2 - 6x + 8$ .

- [1] (a) Show that  $x - 1$  is a factor of  $f(x)$ .
- [4] (b) Find  $a, b \in \mathbb{R}$  such that  $f(x) = (x - 1)(x - a)(x - b)$ .
- [2] (c) Construct the sign diagram for  $f(x)$ .
- [2] (d) Solve the inequality  $x^3 + 8 \geq 3x^2 + 6x$ .

- [3] (e) Sketch the graph of the function  $f$  from the previous page.

[6]      3. (a) Sketch the graph of  $f(x) = \frac{x-1}{x^2+x}$ .

[4]      (b) Solve the rational inequality  $\frac{2}{x} - \frac{2}{x+1} \geq 1$ .

[2] 4. (a) What are the values of  $\sin\left(\frac{17\pi}{4}\right)$  and  $\cos\left(\frac{-25\pi}{6}\right)$ ?

[4] (b) What is the value of  $\cos\left(\frac{5\pi}{12}\right)$ ? (Hint:  $5 = 9 - 4$ )

[4] (c) Verify the identity  $\frac{1}{1 - \sin \theta} = \sec^2 \theta + \sec \theta \tan \theta$ .

**Some stuff about trig functions that you possibly didn't remember**

- Values of  $\sin \theta$  and  $\cos \theta$  in the first quadrant:

$\sin 0 = 0$	$\cos 0 = 1$
$\sin \pi/6 = 1/2$	$\cos \pi/6 = \sqrt{3}/2$
$\sin \pi/4 = \sqrt{2}/2$	$\cos \pi/4 = \sqrt{2}/2$
$\sin \pi/3 = \sqrt{3}/2$	$\cos \pi/3 = 1/2$
$\sin \pi/2 = 1$	$\cos \pi/2 = 0$

- Fundamental identities:

1.  $\tan \theta = \frac{\sin \theta}{\cos \theta}$ ,  $\cot \theta = \frac{\cos \theta}{\sin \theta}$ ,  $\sec \theta = \frac{1}{\cos \theta}$ ,  $\csc \theta = \frac{1}{\sin \theta}$

2.  $\cos^2 \theta + \sin^2 \theta = 1$

3.  $\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$

4.  $\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$

5.  $\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$

6.  $\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$

- Obvious but occasionally forgotten facts that are sometimes useful in conjunction with some of the identities above:

1.  $2\theta = \theta + \theta$

2.  $\theta = \frac{\theta}{2} + \frac{\theta}{2}$