University of Lethbridge
Department of Mathematics and Computer Science
16th November, 2015, 4:00 - 4:50 pm
MATH 1010A - Test #2

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:

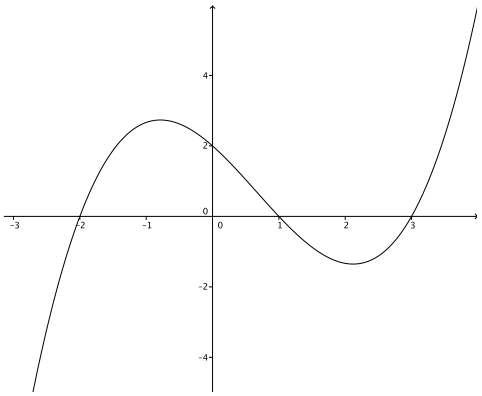
Problem	Grade
1	/8
2	/12
4	/10
5	/10
Total	/40

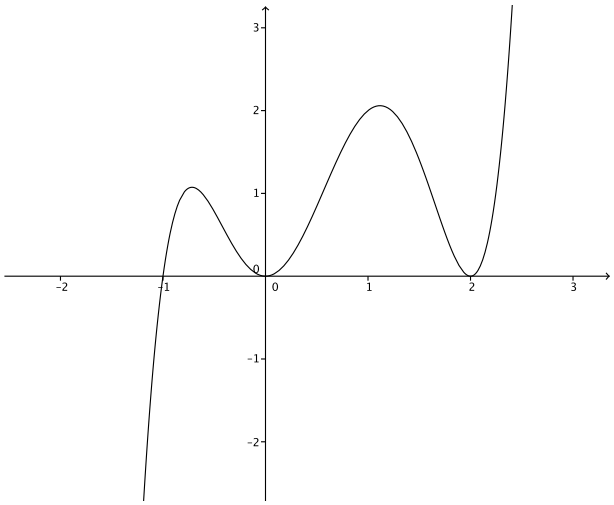
B

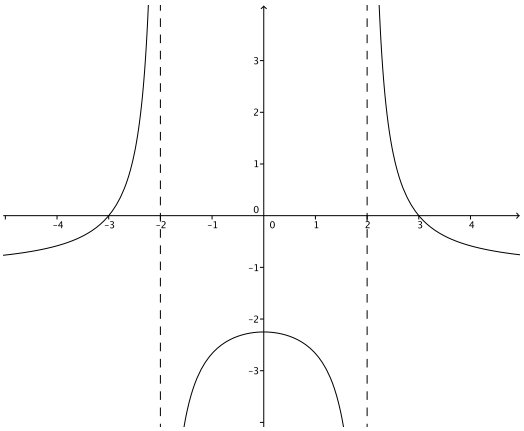
[8] 1. Match the following functions with their graphs below:

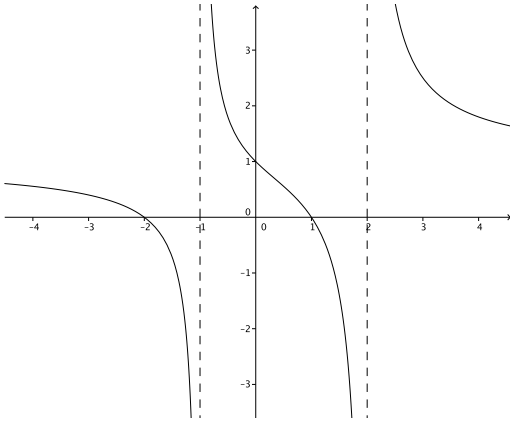
$$f(x) = x^2(x+1)(x-2)^2, \qquad h(x) = \frac{(x+2)(x-1)}{(x+1)(x-2)},$$

$$g(x) = \frac{1}{3}(x+2)(x-1)(x-3), \qquad k(x) = \frac{9-x^2}{x^2-4}$$









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 $f(x) = \dfrac{x-1}{x^2+x}$.

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

[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:

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

- Fundamental identities:
  1. $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$, $\cot\theta = \dfrac{\cos\theta}{\sin\theta}$, $\sec\theta = \dfrac{1}{\cos\theta}$, $\csc\theta = \dfrac{1}{\sin\theta}$
  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. $\theta = \dfrac{\theta}{2} + \dfrac{\theta}{2}$