Math 1A: Discussion 8/29/2018

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After this week, you should be able to:

- Determine whether a function is even or odd. (To do this, compute $f(-x)$)
- Find the domain of a function, paying attention to denominators and square roots.
- Solve quadratic equations for x by factoring.
- Evaluate difference quotients of the form $\frac{f(x+h)-f(x)}{h}$.
- Graph basic functions. (In particular, linear functions and quadratic functions)
- Characterize polynomials by their zeros.

1 Problem Set 1

1.1 Question 1

Review of trigonometric functions:

- Evaluate $\sin\left(\frac{5\pi}{3}\right)$ and $\tan\left(\frac{11\pi}{4}\right)$.
- For what values of x do we have $\cos(x) = -\frac{1}{2}$?
- What is the domain of $\tan(x)$?

1.2 Question 2

Are the domains of the functions $f(s)$ and $g(s)$ below the same?

$$f(s) = 1 - \sqrt{2-s}$$
$$g(s) = \frac{1}{1-\sqrt{2-s}}$$

2 Problem Set 2

2.1 Question 3

Find the domain of the following functions.

$$f(t) = \frac{1}{\sqrt{t^2-3t+2}}$$

$$g(t) = \frac{1}{2 + \frac{1}{t-2}}$$

$$h(t) = \frac{1}{\frac{4}{\sqrt{t^2-1}} - 1}$$

$$u(t) = \frac{\tan(t)}{1 + \sin(t)}$$

$$v(t) = \frac{t}{\sqrt[3]{t^2 - 1}}$$

$$s(t) = \frac{t}{\sqrt{(\sqrt{t}) - 1}}$$

2.2 Question 4

Review of quadratic functions:

- Find a quadratic function $f(x)$ that has exactly one zero at $x = 1$ and has a y-intercept at $(0, 3)$. What is the domain and range of $f(x)$?
- Find a quadratic function $h(x)$ that has exactly two zeros at $x = -1$ and $x = 2$ that also passes through the point $(3, -8)$.
- Give an example of a quadratic function that has no zeros.

3 Problem Set 3

3.1 Question 5 (*)

Find the domain of the function

$$f(x) = \frac{1}{\sqrt{2\,\sin^3(x) - 3\,\sin^2(x) - 2\,\sin(x)}}$$

3.2 Question 6 (**)

In this question, we prove the (cool) fact that the sum of any multiple of sine and any multiple of cosine is still a sine function. We do this in the following steps.

- If a and b are real numbers satisfying $a^2 + b^2 = 1$, show that

  $$a\,\sin(t) + b\,\cos(t) = \sin(t + \delta)$$

  for some real number δ. (Hint: Use the trigonometric identities $\cos^2(x) + \sin^2(x) = 1$ and $\sin(x + y) = \sin(x)\cos(y) + \cos(x)\sin(y)$).
- If A and B are any real numbers, show that

  $$A\,\sin(t) + B\,\cos(t) = C\,\sin(t + \delta)$$

  for some real numbers C and δ. (Hint: Use the result from the previous part)