

Group Exercises 1

MATH 11A - Discussion Section C
January 23, 2017

- (1) For each function transformation graph the result when acted on $f(x)$ and write down its corresponding formula given $f(x) = e^x$:
- (a) Shift down by 3
 - (b) Shift right by 7
 - (c) Reflect about the x -axis
 - (d) Reflect about the y -axis
 - (e) Reflect about the origin
- (2) Find the domain of the following functions:
- (a) $f(x) = \frac{7-x}{e^x-1}$
 - (b) $g(x) = \frac{e^x}{x^2-x-1}$
 - (c) $h(x) = \frac{x^\pi-x+1}{x^3+x^2-x}$
 - (d) $j(x) = \frac{1}{e^{x^2+2x-1}}$
 - (e) $m(x) = \frac{x+\pi}{e^{\sin(x)}}$
- (3) The half-life of Polonium-210 is 138.376 days. Given that we start with a sample of 500mg, answer the following:
- (a) Write down a formula that models how much of the sample is left after t days.
 - (b) How much of the sample remains after 2 years?
 - (c) At what value of t does the sample have 200mg left?
- (4) Determine whether the following functions are one-to-one (injective) on the provided domains:
- (a) $f(x) = \cos(x)$ where $x \in \mathbb{R}$
 - (b) $g(x) = \cos(x)$ where $x \in [0, \pi]$
 - (c) $h(x) = \frac{x^2-x+7}{x-1}$ where $x \in (-\infty, 1) \cup (1, \infty)$
 - (d) $j(x) = \ln(x)$ where $x \in (0, \infty)$
 - (e) $m(x) = \ln|x|$ where $x \in \mathbb{R}$
 - (f) $n(x) = \frac{x}{|x|}$ where $x \in (-\infty, 0) \cup (0, \infty)$
- (5) Determine a formula for the inverse, if it exists:
- (a) $f(x) = \frac{2x-1}{5x+3}$ where $x \in \left(-\infty, -\frac{3}{5}\right) \cup \left(-\frac{3}{5}, \infty\right)$
 - (b) $g(x) = e^{x-3}$ where $x \in \mathbb{R}$
 - (c) $h(x) = e^{(7-x)^3+10}$ where $x \in \mathbb{R}$
 - (d) $j(x) = \ln(x^3+4)$ where $x \in \mathbb{R}$
 - (e) $m(x) = \ln(x^2)$ where $x \in \mathbb{R}$
 - (f) $n(x) = x^2$ where $x \in \mathbb{R}$
 - (g) $p(x) = x^2$ where $x \in [0, \infty)$
- (6) Graph the following piecewise functions and determine if they are continuous:

a) $f(x) = \begin{cases} |x|, & x < 0 \\ x^2, & x \geq 0 \end{cases}$

b) $g(x) = \begin{cases} x+1, & x < 0 \\ x+10, & x \geq 0 \end{cases}$

c) $h(x) = \begin{cases} x+1, & x < 0 \\ 0, & x = 0 \\ 1-x, & x > 0 \end{cases}$

- (7) Simplify the following expressions in terms of a single logarithm:
- (a) $7 \log_{12}(x) + 21 \log_{12}(y)$
 - (b) $3 \log(x) - 6 \log(y)$
 - (c) $5 \ln(x + y) - 21 \ln(x) - 8 \ln(y)$
 - (d) $\log_7(x) + \ln(y)$
 - (e) $\ln(y^2) - \ln(x) + 2 \log(y)$
- (8) Determine whether the following are true or false:
- (a) If $x \in \mathbb{R}$, then $\sqrt{x^2} = x$.
 - (b) If f and g are two continuous functions, then $f \circ g = g \circ f$.
 - (c) For any given function f we have $f(x + y) = f(x) + f(y)$.
 - (d) Given that f is a linear function that passes through the origin, then we must have $f(\alpha x + \beta y) = \alpha f(x) + \beta f(y)$.
 - (e) If $x < y$ and f is a strictly decreasing function, then $f(x) > f(y)$.
 - (f) If $\alpha, x \in \mathbb{R}$, then $\ln(x^\alpha) = \alpha \ln(x)$.
- (9) Determine a formula for the general term a_n given the following sequences:
- (a) $\{1, -1, 1, -1, 1, -1, \dots\}$
 - (b) $\{2, 3, 2, 3, 2, 3, \dots\}$
 - (c) $\{1, \frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \frac{1}{9}, \dots\}$
 - (d) $\{1, -\frac{1}{3}, \frac{1}{9}, -\frac{1}{27}, \frac{1}{81}, \dots\}$
 - (e) $\{1, r, r^2, r^3, r^4, \dots\}$
 - (f) $\{\sqrt{2}, \sqrt{2\sqrt{2}}, \sqrt{2\sqrt{2\sqrt{2}}}, \dots\}$
- (10) Determine a formula for each situation:
- (a) Linear function that passes through $(-2, 4)$ and $(2, 0)$.
 - (b) Exponential function that passes through $(-1, 10)$ and $(2, 30)$.
 - (c) Linear function that has slope $m = 5$ and passes through $(0, 10)$.
 - (d) Quadratic function that has roots at $x = -3$ and $x = 3$ while passing through $(10, 10)$.
 - (e) Exponential function that has a horizontal asymptote of $y = -1$ and passes through $(1, 1)$ and $(5, 10)$.