Solutions to Review for Exam I

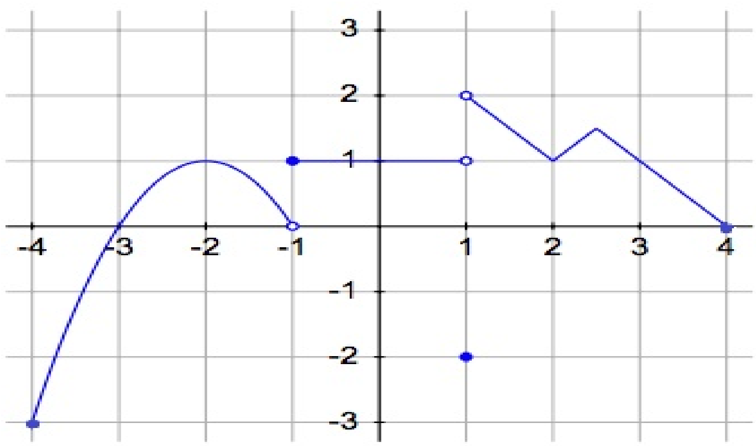
MATH 1113 sections 51 & 52 Fall 2018

Sections Covered: 1.3, 1.4, 1.2, 2.2, 2.3, 2.1, 2.5

Calculator Policy: There will be NO calculator use on this exam. You are strongly encouraged to prepare for the exam without relying on a calculator.

This review is provided as a courtesy to give some idea of what material is covered. Nothing else is intended or implied.

(1) Use the graph of $y = f(x)$ shown to answer the following questions.



1. Evaluate $f(-1) = 1$

2. On which intervals is f increasing? $(-4, -2)$ and $(2, 5/2)$

3. Evaluate $f(1) = -2$

4. Find all solutions of the equation $f(x) = 0$. There are two solutions, -3 and 4.

5. How many solutions are there to the equation $f(x) = \frac{1}{2}$? There appear to be three, one between -3 and -2, another between -2 and -1, and a third between 3 and 4.

6. Identify an interval over which f is constant. The largest is $(-1, 1)$.

7. Evaluate $f(f(-3))$. How about $f(f(f(-3))$? $f(f(-3)) = f(0) = 1$ and $f(f(f(-3)) = f(f(0)) = f(1) = -2$

(2) Find the domain of each function. Express the answer using interval notation.

(a) $f(x) = \dfrac{1}{x^2 - 4}$ $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$

(b) $H(t) = \sqrt{1 - |t|}$ $[-1, 1]$

(c) $g(v) = \dfrac{1}{v^2 + 3}$ $(-\infty, \infty)$

(3) Let $f(x) = 2x^2 - 3x$. Evaluate each of the following.

1. $f(2)$ $= 2$
2. $f(-2)$ $= 14$
3. $f(r)$ $= 2r^2 - 3r$
4. $f(4r)$ $= 32r^2 - 12r$
5. $f(x + h)$ $= 2x^2 + 4xh + 2h^2 - 3x - 3h$
6. $f(x + h) - f(x)$ $= 4xh + 2h^2 - 3h$
7. $\dfrac{f(x + h) - f(x)}{h}$ $= 4x + 2h - 3$

(4) Consider the functions

$$f(x) = \sqrt{x^2 + 1}, \qquad g(x) = \frac{1}{x - 1,} \qquad \text{and} \qquad h(x) = 3x^2$$

Evaluate each expression. Simplify if possible.

1. $(f + g)(0)$ $= 0$
2. $\left(\dfrac{h}{f}\right)(1)$ $= \dfrac{3}{\sqrt{2}}$
3. $(hg)(2)$ $= 12$
4. $(f \circ g)(0)$ $= \sqrt{2}$
5. $(g \circ f)(0)$ $=$ undefined

6. $(h \circ f)(2) \quad = 15$

7. $(f \circ f)(1) \quad = \sqrt{3}$

8. $(f \circ g)(x) \quad = \sqrt{\dfrac{x^2 - 2x + 2}{(x-1)^2}}$

9. $(h \circ g)(x) \quad = \dfrac{3}{(x-1)^2}$

(5) A company wants to manufacture widgets. There is a one time expense of $3000 for the manufacturing equipment, and it costs $10 in material and labor to produce each widget.

(a) Write a linear function $C(x)$ representing the cost in dollars associated with producing x widgets. $C(x) = 3000 + 10x$

(b) What is the cost to produce 250 widgets? $C(250) = 5500$, so the cost is $ 5500.

(c) Suppose the widgets will sell for $17.50 each. How many widgets have to be sold to break even? The break even production is 400 widgets. Note that if x sell, the revenue is $17.5x$. Setting revenue equal to cost gives the equation for the break even x value $17.5x = 3000 + 10x$.

(6) Consider the two lines L_1 and L_2 given below.

$$L_1 \quad 2x - y = 3 \quad \text{and} \quad L_2 \quad 16x + 4y = 1$$

1. Write L_1 and L_2 in slope intercept form. L_1 is $y = 2x - 3$ and L_2 is $y = -4x + \frac{1}{4}$

2. Determine if L_1 and L_2 are parallel, perpendicular, or neither. They are neither (slopes are not equal nor do they muliply to -1).

3. Find a line parallel to L_1 that passes through the point $(3, 7)$. $y = 2x + 1$

4. Find a line perpendicular to L_2 that passes through the origin. $y = \frac{x}{4}$

5. Find all numbers k such that the line through $(1, k)$ and $(0, 4)$ is parallel to L_1. Solve $2 = \frac{4-k}{0-1}$ to get $k = 6$.

6. Find all numbers k such that the line through the points $(1, k)$ and $(k, 2)$ is perpendicular to L_2. Solve the equation $\frac{1}{4} = \frac{2-k}{k-1}$ to get $k = \frac{9}{5}$.

(7) Use transformations to produce a rough plot of each of the following. Label key points (such as intercepts)

(a) $y = \sqrt{x-2}$

(b) $y = \sqrt{x} - 2$

(c) $y = (x+3)^3 + 1$

(d) $y = -\sqrt{x+2}$