Math 10A MIDTERM #1
is in **Peter 108 at 8-9pm**
this Wed, Oct 24

Log in TritonEd to view your assigned seat.
Midterm covers Sections 1.1-1.3, 1.5, 1.6, 2.1-2.4
which are homeworks 1, 2, and 3.

You don't need blue books. Calculators are not allowed.
You are allowed one double sided 8.5 by 11 inch page of
handwritten notes. Bring your student ID.

Midterm 1 Topics

1.1 function basic
 (a) table, graph, equation (b) domain and range

1.2 function types
 (a) line, quad, poly, power, exp, log, trig

1.3 function building
 (a) shift, scale, flip (b) composition

1.5 exponential functions
 (a) doubling, half life

1.6 logarithmic functions and inverses

2.1 tangents and secants
 (a) slope, average velocity

2.2 limits of graphs

2.3 limits of equations

2.4 continuity of graphs and equations

Midterm 1 Practice Questions and Answers

Sec 1.1 Function Basics (table, graph, equation. domain and range)

Calculate the following:

1. $f(6)$
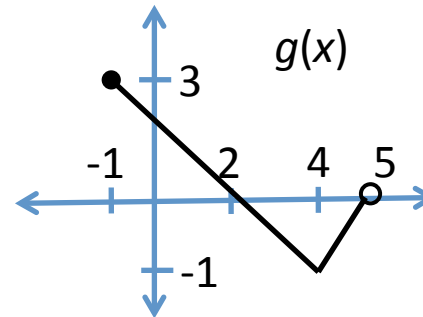2. $g(2)$
3. $h(1)$
4. What x has $f(x) = 1$
5. What x has $g(x) = -1$
6. What x has $h(x) = 3$
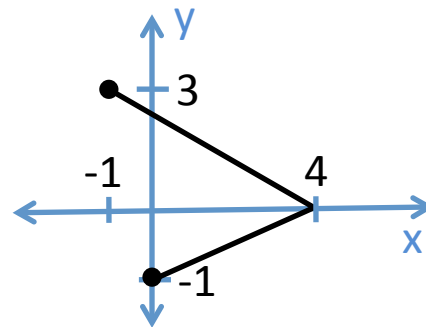7. What is the domain and range of f, g, and h.
8. Which of the following three relationships is a function of x?

x	$f(x)$
3	5
6	1
8	-3
9	6

$h(x) = \sqrt{x+3}$

x	y
1	2
3	8
1	5
4	8

$y^2 = x$

Sec 1.1 Answers

Calculate the following:

1. $f(6) = 1$

2. $g(2) = 0$

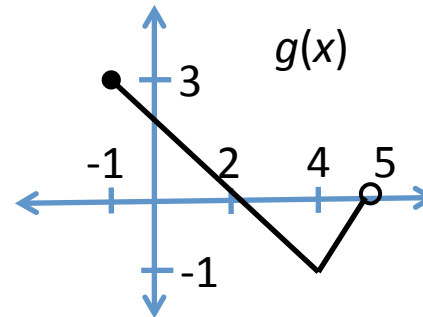3. $h(1) = 2$

4. $x = 6$

5. $x = 4$

6. $x = 6$

x	f(x)
3	5
6	1
8	-3
9	6

$h(x) = \sqrt{x+3}$

7. domain f = {3, 6, 8, 9}, range f = {5, 1, -3, 6}.
   domain g = [-1,5), range g = [-1,3]
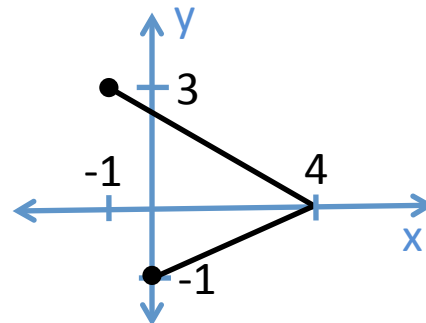   domain h = [-3,∞), range h = [0,∞)

8. None of the following relationships are functions of x.

x	y
1	2
3	8
1	5
4	8

$y^2 = x$

Sec 1.2 Function Types (line, quad, poly, power, exp, log, trig)

1. Give an example of a (a) linear function, (b) quadratic function, (c) polynomial function, (d) power function, (e) exponential function, (f) logarithmic function, and (g) trigonometric function.

2. Find the equation of the line that goes through the points (1,2) and (6,17).

3. Find the equation of the line that has vertex (1,3) and goes through the point (3,11).

Sec 1.2 Answers

1a. $y = x$

1b. $y = x^2$

1c. $y = x^3$

1d. $y = x^4$

1e. $y = 2^x$
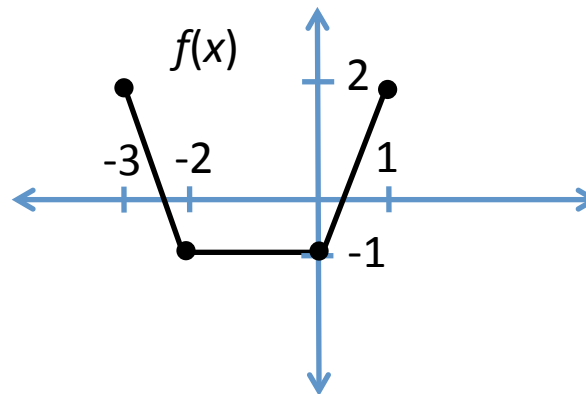
1f. $y = \log(x)$

1g. $y = \sin(x)$

2. $y = 3x - 1$

3. $y = 2(x-1)^2 + 3$

Sec 1.3 Function Building (shift, scale, flip. composition)

Given f(x), draw the following functions
1. y = f(x) + 1
2. y = 2f(x+1)
3. y = f(-x)
4. y = f(2x)

Now consider two more functions

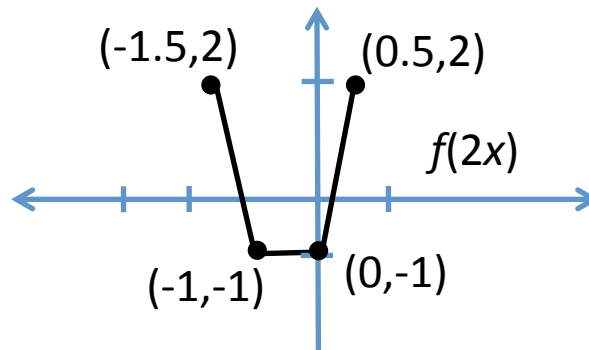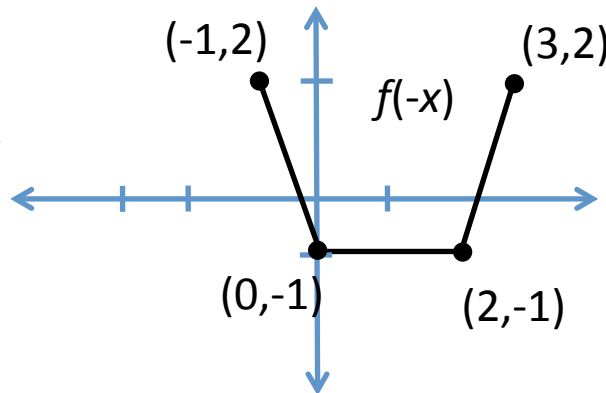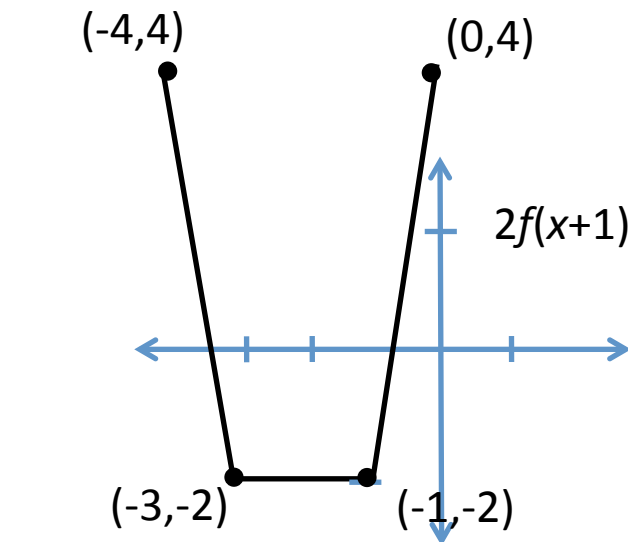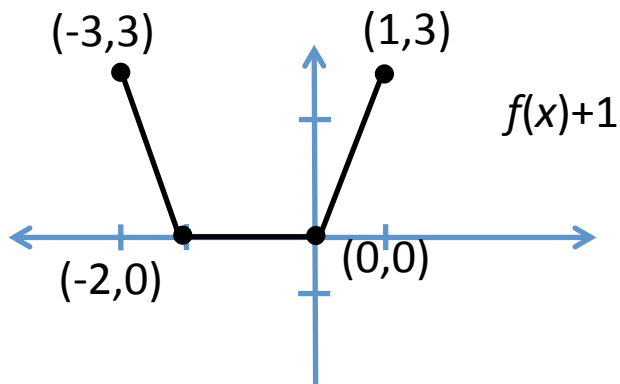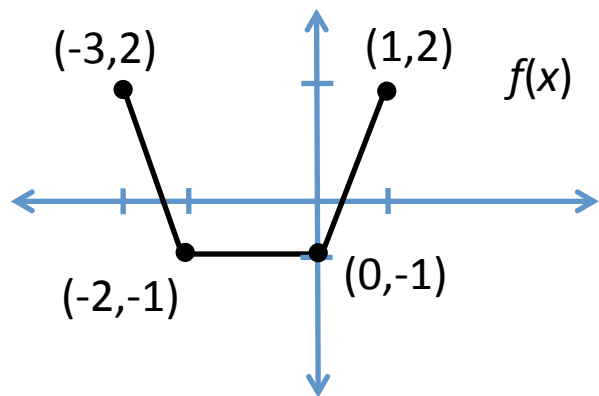$$g(x) = x^2 + x^4 \qquad h(x) = x^2$$

Calculate and simplify the following
5. (g o f)(1)
6. (g o h)(x)
7. (h o g)(x)
8. (g+h)(x)
9. (gh)(x)

Sec 1.3 Answers

1. $y = f(x) + 1$
2. $y = 2f(x+1)$
3. $y = f(-x)$
4. $y = f(2x)$

(-4,4)   (0,4)

$2f(x+1)$

(-3,-2)   (-1,-2)

5. $(g \circ f)(1) = 20$
6. $(g \circ h)(x) = x^4 + x^8$
7. $(h \circ g)(x) =$
   $x^4 + 2x^6 + x^8$
8. $(g+h)(x) = 2x^2 + x^4$
9. $(gh)(x) = x^4 + x^6$

(-3,2)   (1,2) $f(x)$

(-2,-1)   (0,-1)

(-1,2)   (3,2)

$f(-x)$

(0,-1)   (2,-1)

(-3,3)   (1,3)

$f(x)+1$

(-2,0)   (0,0)

(-1.5,2)   (0.5,2)

$f(2x)$

(-1,-1)   (0,-1)

Sec 1.5 Exponential Functions (doubling, half life)

1. An unstable isotope has a half life of 3 hours. We begin with 50 grams of this isotope, write the function for how many grams remain after t hours.

2a. Bacteria doubles every 5 hours. We begin with 300 cells of bacteria, write the function for how many cells exist after t hours.

2b. At what time will we have 900 cells of bacteria?

Sec 1.5 Answers

1. $f(t) = 50(\frac{1}{2})^{\frac{t}{3}}$

2a. $f(t) = 300(2)^{\frac{t}{5}}$

2b. $t = 5\log_2 3$

Sec 1.6 Logarithmic Functions and Inverses

Calculate the inverses of the following functions

1. $y = 3x - 6$
2. $y = \log_{10}(3x)$
3. $y = 1 + e^{x+2}$
4. $y = (x+2)^2$ for $x > -2$

Solve the following equations for x

5. $2^{3x} = 64$
6. $10 = 15 - 3^{x+1}$
7. $\log_4(2x) + 1 = 4$

Sec 1.6 Answers

1. $y = (1/3)x + 2$
2. $y = (1/3)10^x$
3. $y = \ln(x-1) - 2$
4. $y = \sqrt{x} - 2$ for $x > 0$

5. $x = 2$
6. $x = \log_3 5 - 1$
7. $x = 32$

Sec 2.1 Secants and Tangents (slope and average velocity)

1. A ball's distance at time = t is $d(t) = 2t^2+3t+1$ where time is in seconds and distance is in feet. Calculate the average velocity of the ball between time = 1 and time = 3.

2. Calculate the slope of the secant line that intersects the graph of $y = 1 + x^3$ at $x = 0$ and $x = 4$.
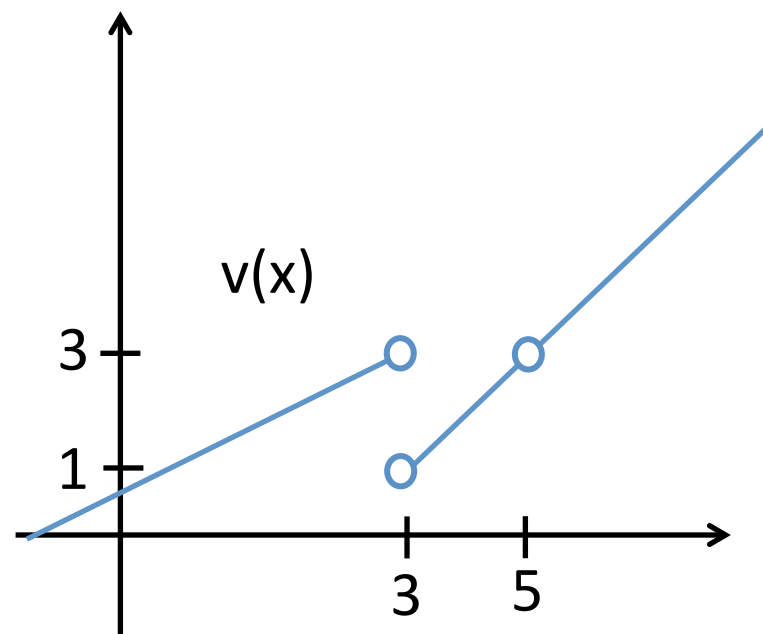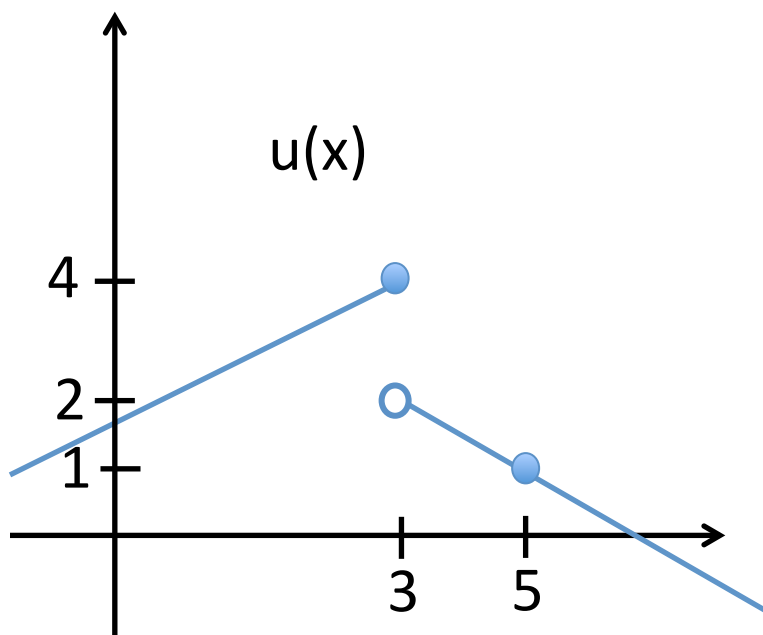
Sec 2.1 Answers

1. Average velocity = (28-6)/(3-1) = 11 ft/sec

2. Slope = (65-1)/(4-0) = 16

Sec 2.2 Limits of graphs

1. Calculate the limits of *u* and *v* at both *x* = 3 and *x* = 5 or state that they do not exist. What are the right limits at those *x* values? What are the left limits?

Sec 2.2 Answers

The limit of u(x) at x=3 does not exist. The left limit = 4, the right limit = 2.
The limit of u(x) at x=5 is equal to 1. The left limit = 1, the right limit = 1.
The limit of v(x) at x=3 does not exist. The left limit = 3, the right limit = 1.
The limit of v(x) at x=5 is equal to 3. The left limit = 3, the right limit =3.

Sec 2.3 Limits of equations

Calculate the following or state "does not exist".

1. $\lim\limits_{x \to 0} \dfrac{x^2 + x}{x}$

2. $\lim\limits_{x \to 0} \dfrac{x+2}{x}$

3. $\lim\limits_{x \to 1} \dfrac{x-1}{1 - \sqrt{2-x}}$

4. $\lim\limits_{x \to 2} \dfrac{x^2 - 4x + 4}{x-2}$

Recall the strategy
1. Try plug in
2. Try factor and reduce
3. If square root, try rationalize
4. If sin or cos, try squeeze
5. Last try approximate

Sec 2.3 Answers

1. factor and reduce to get limit = 1
2. plug in to get limit "does not exist"
3. rationalize to get limit = 2
4. factor and reduce to get limit = 0

Sec 2.3 Limits of piecewise equations

1. For which value(s) of b does the limit of $h(x)$ at $x = 0$ exist?

$$h(x) = \begin{cases} 2^x - b \text{ if } x \geq 0 \\ b - 3x \text{ if } x < 0 \end{cases}$$

2. If $b = 0$, then what is the limit of $h(x)$ at $x = 1$.
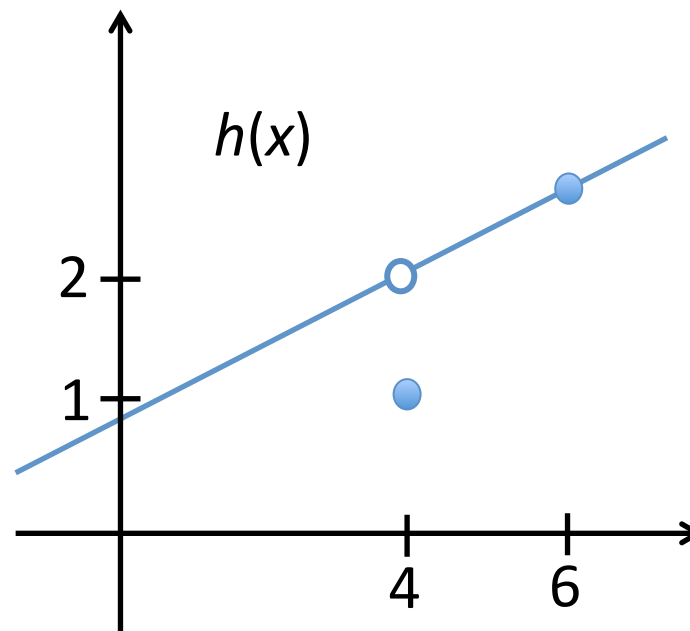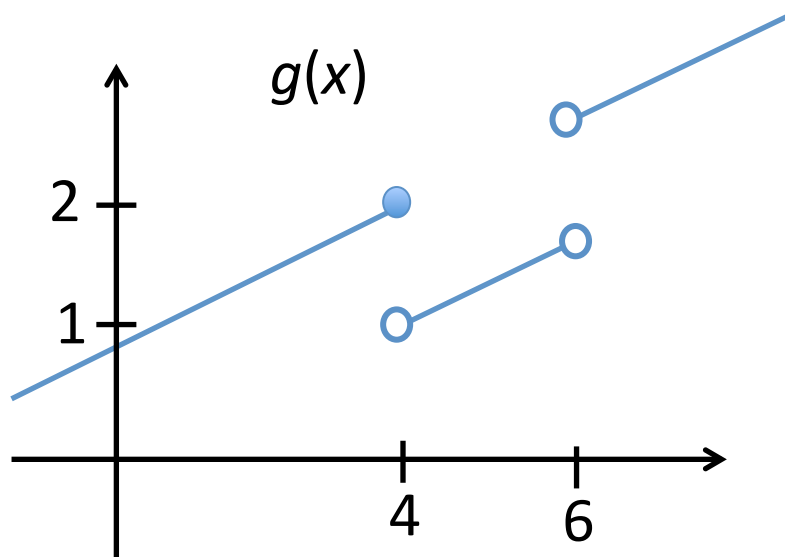
Sec 2.3 Answers

1. b = ½
2. limit = 2

Sec 2.4 Continuity

1. For which value(s) of *c* is *f(x)* continuous at *x* = 1? *(Hint: ln(1) = 0)*

$$f(x) = \begin{cases} c + \ln x & \text{if } x > 1 \\ \frac{2c+4}{x+3} & \text{if } x \leq 1 \end{cases}$$

2. Are the functions g and h continuous at x = 4 and x = 6? Are they right continuous at those x values? left continuous?

Sec 2.4 Answers

1. c = 2
2a. g(x) at x=4 is not continuous, yes left continuous, not right continuous
2b. g(x) at x=6 is not continuous, not left continuous, not right continuous
2c. h(x) at x=4 is not continuous, not left continuous, not right continuous
2d. h(x) at x=6 is yes continuous, yes left continuous, yes right continuous