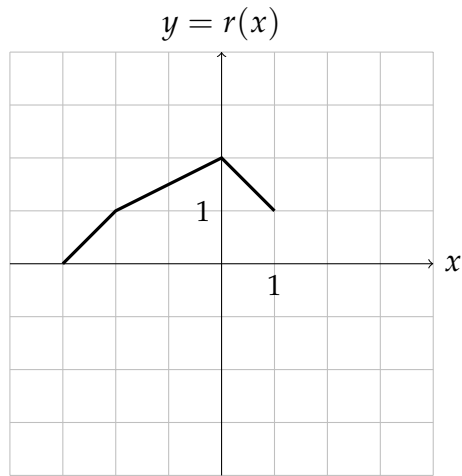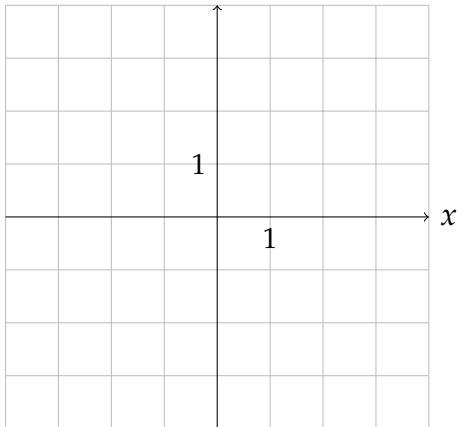# Midterm #1 Practice Problems

1. Below is the graph of a function $y = r(x)$.

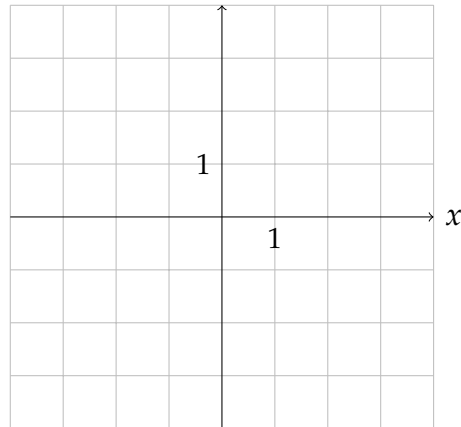$$y = r(x)$$

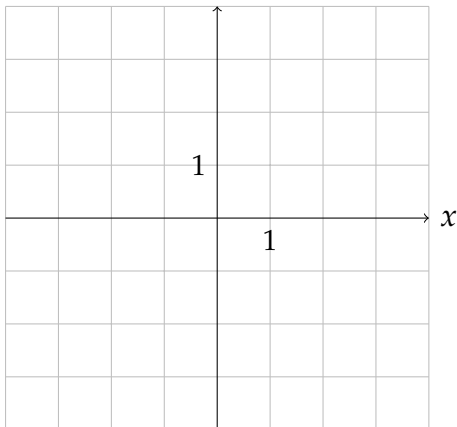Sketch graphs of the following functions:

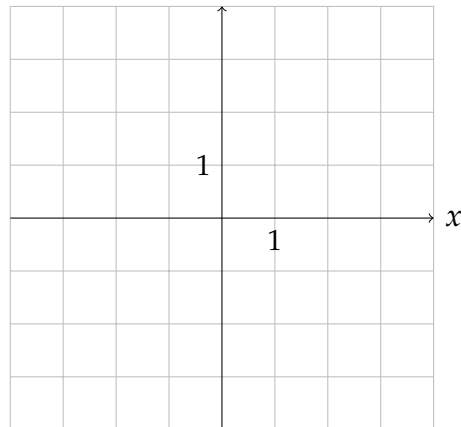(a) $y = 2r(x - 3)$

(b) $y = r(-x) - 3$

(c) $y = r(2x) + 1$

(d) $y = -r(x + 1)$

2. The equation $7x - 11y = 16$ describes a line in the xy-plane.

(a) Find the slope of the line.

(b) What is the y-intercept of the line?

(c) What is the x-intercept of the line?

(d) Is the point $(7, 3)$ on this line?

3. QwikWidgets, Inc., manufactures widgets (as you might expect). On a given production run, they can make 10,000 two-inch stainless-steel widgets for $1200 and 50,000 for $4400. Assume that their costs change linearly with their production size.

(a) Once their widget-producing machines are up and running, how much does it cost to produce an extra widget? (This is called the *marginal cost* of production.)

(b) How much would it cost QwikWidgets only to turn on the widget-making machines, without actually making any widgets at all?

(c) Write a formula for the cost of making w widgets on a given production run.

(d) How much would it cost to manufacture 100,000 widgets?

4. Below is a graph of the population $P(t)$ of wolves in a forest t years after the year 2000.
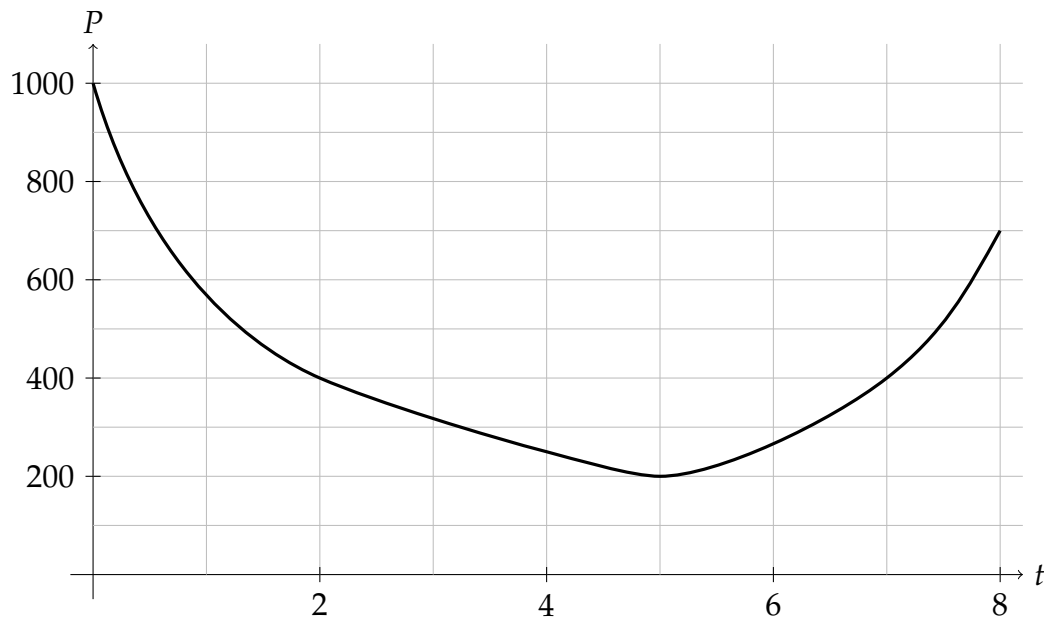
(a) Over which time intervals is the graph increasing? decreasing? concave up? concave down?

(b) What is the average rate of change of the population from 2000 to 2002?

(c) What is the percentage change in the population from 2007 to 2008?

5. Savvy Sally invests $5000 in a mutual fund and receives a steady interest rate of 8%.

(a) If the interest is compounded annually, write a function $V(t)$ giving the value of Sally's investment after t years.

(b) What is the formula for $V(t)$ if the interest is instead compounded quarterly?

(c) What is the formula for $V(t)$ if the interest is instead compounded continuously?

6. In each equation, solve for x symbolically.

(a) $25 = 3^x$

(b) $x^5 = 79$

(c) $3 = \ln(2x + 5)$

7. Define functions $f(x) = 2x - 3$ and $g(x) = x^2 - x$. Find formulas for:

(a) $f(g(x))$ (b) $g(f(x))$ (c) $g(g(x))$ (d) $f(f(x))$

8. Foolish Frank invests in penny stocks. The value of his investment is given by

$$V(t) = 4500e^{-0.12t}$$

where t, in years, is the age of the investment.

(a) How much did Frank invest initially?

(b) What is the continuous growth rate of Frank's investment?

(c) Find the time t when Frank's investment reaches $1000. You do not need a decimal value for this t, but it should be an expression you could evaluate on a calculator.

9. Below are tables of values for functions $h(x)$, $j(x)$, and $k(x)$ at different values of x.

x	-2	-1	0	1	2
$h(x)$	48	24	12	6	3
$j(x)$	48	40	31	21	10
$k(x)$	48	41	34	27	20

(a) Is $h(x)$ linear, exponential, or neither? Write a formula for $h(x)$, if possible.

(b) Is $j(x)$ linear, exponential, or neither? Write a formula for $j(x)$, if possible.

(c) Is $k(x)$ linear, exponential, or neither? Write a formula for $k(x)$, if possible.

10. You acquire a 50-gram sample of iodine-131, which has a half-life of 8 days.

(a) Write a function $f(t)$ that represents the amount of iodine left after t days.

(b) How long will it take for the sample to decay to 1 gram of iodine-131? Write an expression you could evaluate on your calculator.