

# Practice Midterm 2

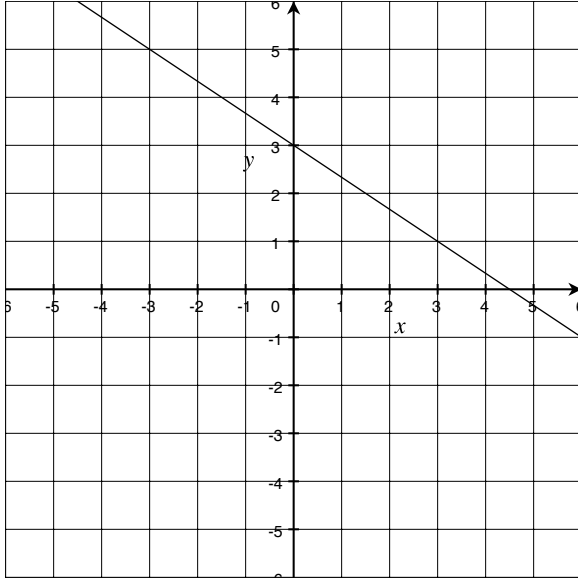
Part I: No calculators allowed.

1. Write an equation in slope-intercept form for the line through the given points.

(a)  $(3, -5)$  and  $(-2, 4)$

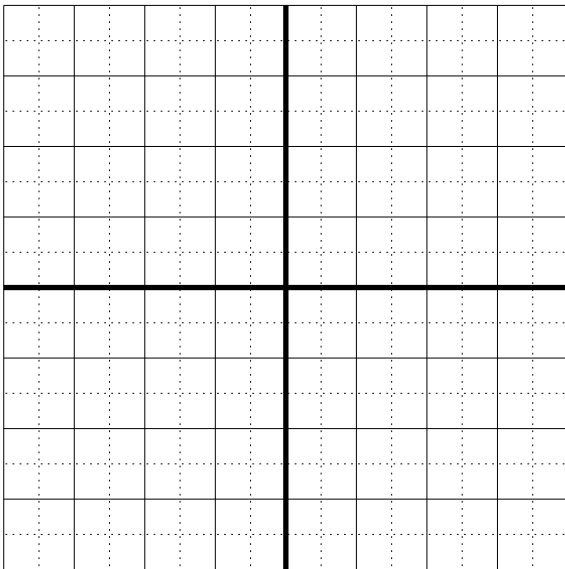
(b)  $(-4, -3)$  and  $(0, -1)$

2. Write an equation in slope-intercept form for the line graphed below:



3. Rewrite the following in slope-intercept form, and then graph it:

$$\frac{1}{2}x + \frac{2}{3}y = \frac{5}{6}$$



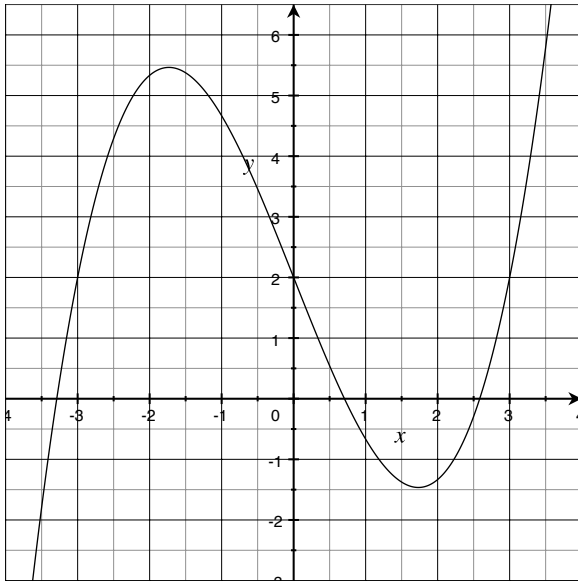
4. The figure below shows the graph of

$$y = \frac{1}{3}x^3 - 3x + 2$$

(a) Using the graph, solve  $\frac{1}{3}x^3 - 3x + 2 = 6$ .

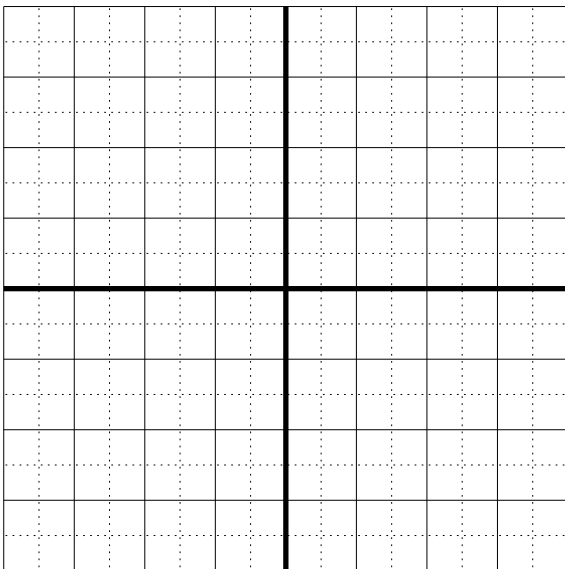
(b) Using the graph, solve  $\frac{1}{3}x^3 - 3x + 2 = 5$ .

(c) Using the graph, solve  $\frac{1}{3}x^3 - 3x + 2 < 1$ .

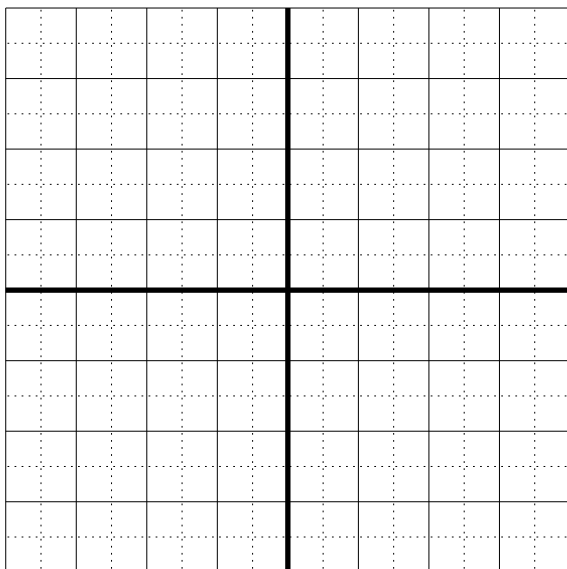


5. On the axes below, sketch the graph of

$$f(x) = \begin{cases} x^3 & \text{if } x \leq 1 \\ x - 1 & \text{if } x > 1 \end{cases}$$



6. Using transformations, sketch a graph of  $f(x) = |x + 3| - 4$ . Explicitly state the coordinates of at least 3 points.



7. Solve each of the following equations or inequalities algebraically.

(a)  $|9 - 5y| = 3$

(b)  $-29 = |2z + 3|$

(c)  $|2x + 0.3| \leq 0.5$

(d)  $\left| \frac{7 - 2x}{5} \right| > 1$

(e)  $6 \left( \frac{w - 1}{3} \right)^2 - 4 = 2$

(f)  $(7x - 1)^2 = 15$

(g)  $15 = 3\sqrt{z + 1}$

8. Write each expression without negative exponents, and simplify.

(a)  $\frac{x^{-7}}{x^{-4}}$

(b)  $\left( \frac{6a^{-3}}{b^2} \right)^{-2}$

(c)  $\frac{4v^{-5}(v^{-2})^{-4}}{3v^{-8}}$

(d)  $3y^{-3/8} \left( \frac{1}{4}y^{-1/4} + y^{3/4} \right)$

9. Solve.

(a)  $x^{2/3} + 2 = 6$

(b)  $(y - 1)^{-3/2} = 8$

(c)  $(5x + 2)^{-1/3} = \frac{1}{4}$

(d)  $2\sqrt[3]{2x - 3} = 6$

10. Solve by factoring or by completing the square. Solutions obtained via the quadratic formula will not receive any credit.

(a)  $6y = (y + 1)^2 + 3$

(b)  $2x^2 + 3 = 6x$

(c)  $\frac{1}{2}x^2 + \frac{3}{2} = 6x$

(d)  $x(3x + 2) = (x + 2)^2$

11. Solve each quadratic inequality.

(a)  $2y^2 - y \leq 3$

(b)  $28 - 3x - x^2 < 0$

12. Solve algebraically:

$$\begin{aligned}y &= -x^2 + 4x + 2 \\4y - 3x &= 24\end{aligned}$$

13. Solve algebraically:

$$\begin{aligned}x + 5y &= 11 \\2x + 3y &= 8\end{aligned}$$

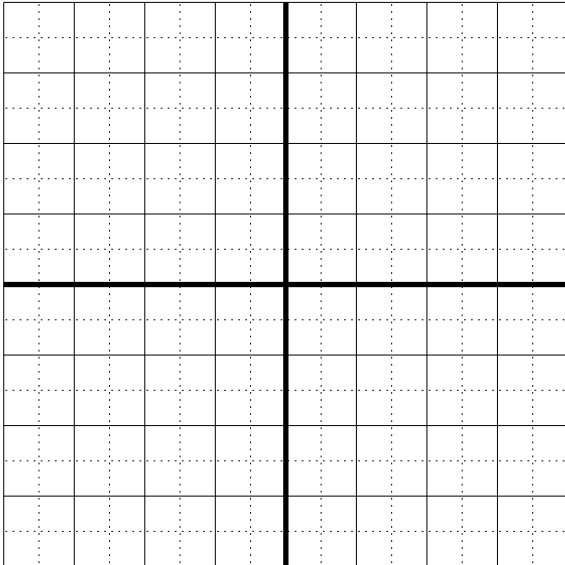
14. Decide whether the following system is inconsistent, dependent, or independent:

$$2x - 3y = 4$$

$$6x - 9y = 12$$

15. Graph the following parabola, being sure to explicitly state the coordinates of the vertex and all intercepts.

$$y = -3x^2 + 2x + 8$$



16. The amount of power,  $P$ , generated by a windmill varies directly with the cube of the windspeed,  $w$ . A particular windmill produces 2000 kilowatts of power when the windspeed is 10 miles per hour.

- (a) Write a function expressing the power as a function of windspeed.
- (b) How much power would the windmill produce in a gentle breeze of 4 miles per hour?
- (c) If the windspeed doubles, by what factor does the power output increase?

17. Solve the quadratic equation  $2x^2 + 5x + 4 = 0$ . Write your solutions in the form  $a + bi$ .

18. Find the zeros, along with their multiplicities, of the function  $f(x) = x^4 - 9x^2$ . Then make a rough sketch of the graph of  $f$ , being sure to show the correct long-term behavior and  $x$ -intercept behavior.

19. Multiply.

(a)  $(x^2 - 2x - 3)(2x^2 + x - 5)$

(b)  $(x + 3)(2x - 1)(2x + 5)$

(c)  $(x - 4)^3$

(d)  $(3 + 2i)(-5 - i)$

20. Find the  $x^4$  term in the product  $(3 - 2x + 2x^3)(5 + 3x - 2x^2 + 4x^4)$ .

21. Factor  $8x^3 - 27y^3$ .

Part II: Calculator problems.

22. The following table shows the teenage birth rates in the US from 1991 to 2000 (measured in the number of births per 1000 women).

| Year   | 1991 | 1993 | 1995 | 1996 | 1997 | 1998 |
|--------|------|------|------|------|------|------|
| Births | 62.1 | 59.6 | 56.8 | 54.4 | 52.3 | 51.1 |

(a) Let  $t$  represent the number of years after 1990. Find the equation of the regression line which gives  $B$ , the number of births, in terms of  $t$ .

(b) Estimate the teen birth rate in 1994.

(c) Predict the teen birth rate in 2010.

23. Solve the inequality  $5x^2 + 39x + 27 \geq 5.4$ .