

**Final Exam**

|        |   |    |   |    |    |    |    |    |   |    |    |    |    |    |    |    |     |
|--------|---|----|---|----|----|----|----|----|---|----|----|----|----|----|----|----|-----|
| Prob.  | 1 | 2  | 3 | 4  | 5  | 6  | 7  | 8  | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |     |
| Value  | 8 | 15 | 6 | 15 | 10 | 10 | 16 | 15 | 5 | 20 | 10 | 5  | 15 | 15 | 15 | 20 | 200 |
| Points |   |    |   |    |    |    |    |    |   |    |    |    |    |    |    |    |     |

Show all work for credit. Answers with little or no supporting work will receive little or no credit.

1. Short answer.  $a = 4.6$ ,  $b = 3.5$ ,  $c = -2.23$ , and  $d = 3$ . Evaluate.

(a)  $-d^2$

(b)  $\frac{b + \sqrt{c^2 + ab}}{a - c}$

2. Solve algebraically:

(a)  $x^4 = 110$

(b)  $30(1.025)^{4x} = 62$

(c) Find the  $x$ -value such that  $kx^2 + 4x + 7$  is a minimum.

3. Simplify to only one appearance of  $x$  (Show work).

$$\frac{x^6 \sqrt{x}}{x^2}$$

4. Of the four ways to solve equations, select the best method for each of the following equations. Select Guess and Check if and only if no other method will work. Do not solve.

(a)  $(x - 3)(x - 5) = 6.7$

(b)  $(x - 3)^2(x - 5) = 0$

(c)  $x^2 + 3\sqrt{x} = 27$

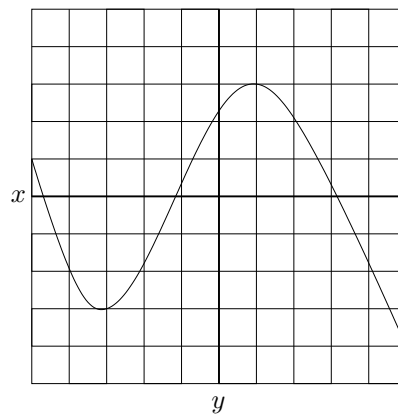
(d)  $(x - 3)^2(x - 5) = 42$

(e)  $\log(2x + 3) = 1.34$

5. Here is a graph of  $f(x)$ . Grid lines are one unit apart.

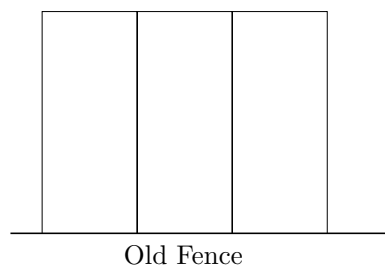
(a) Solve  $f(x) = 2$  for  $x$ .

(b) Solve  $f(x) = -x$ .



6. Give the simplest polynomial  $P$  such that  $P(1) = 0$ ,  $P(-2) = 0$ ,  $P(3) = 0$ , and  $P(5) = 2$ .

7. A rancher builds three pens using a long existing straight fence for one side. He uses 700 feet of new fence and gates as pictured. What dimensions maximize the total area?



8. Let  $f(x) = x^2 + 2$ . Find and simplify  $\frac{f(x+h) - f(x)}{h}$ .

9. Give the end-behavior model of  $\frac{3(x^2 - 2)(x + 3)}{4x - 5}$ .

10. Short Answer:

(a) Give the reference angle of  $\frac{20\pi}{12}$ .

(b) If the central angle is  $\frac{3\pi}{4}$  and the arc-length is  $37\pi$ , what is the radius?

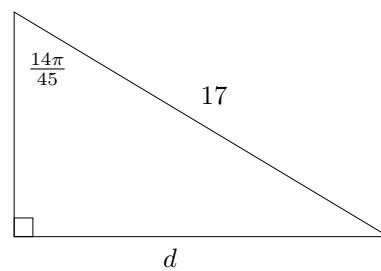
(c) Solve  $\csc(\theta) = 7.3$  for  $\theta$  in radians in the first quadrant.

(d) Convert  $15^\circ$  to radians (give an exact answer).

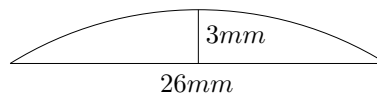
(e) If the central angle is  $\frac{3\pi}{8}$  and the radius is 4, what is the area of the sector?

11. Find the equation of the line that makes a  $20^\circ$  angle with the positive x-axis, and goes through the point  $(8, 10)$ .

12. In the picture, find side  $d$ .

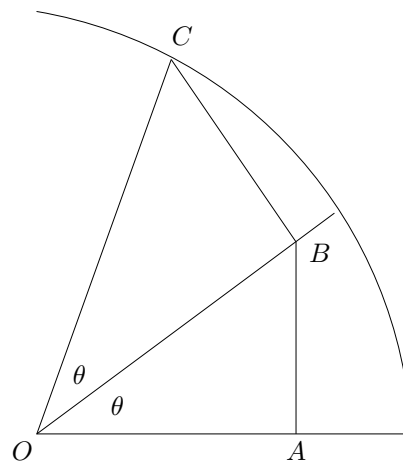


13. When digging in your garden, you find a piece of an old coin. You measure as in the picture. Assuming the coin was round, what was the radius?



14. Determine  $\tan(\cos^{-1}(2x))$ . (Assume the angle is in the first quadrant and give an answer in terms of  $x$  alone).

15. In the unit circle picture to the right, two angles are  $\theta$ , as labelled, and  $OB = .85$ . Find  $AB$ .



16. Given  $\sin(2\theta) = 2(\sin\theta)(\cos\theta)$  and  $\cos(2\theta) = \cos^2\theta - \sin^2\theta$ , derive the Squared Function Identity for  $\sin^2\theta$ .