

**Math 16A, Section 3 - Fall 2017**  
**Instructor: Christopher O'Neill**  
**Practice Exam 3**

**Last Name:** \_\_\_\_\_ **First Name:** \_\_\_\_\_

**Directions:**

- The use of a calculator, cell phone, laptop or computer is prohibited.
- TURN OFF cell phones and put them away. If a cell phone is seen during the exam, your exam will be collected and you will receive a zero.
- Answer all of the questions, and present your solutions in the space provided. *Show all your work* neatly and concisely and *clearly indicate your final answer*. You will be graded not merely on the final answer, but on the quality and correctness of the work leading up to it.

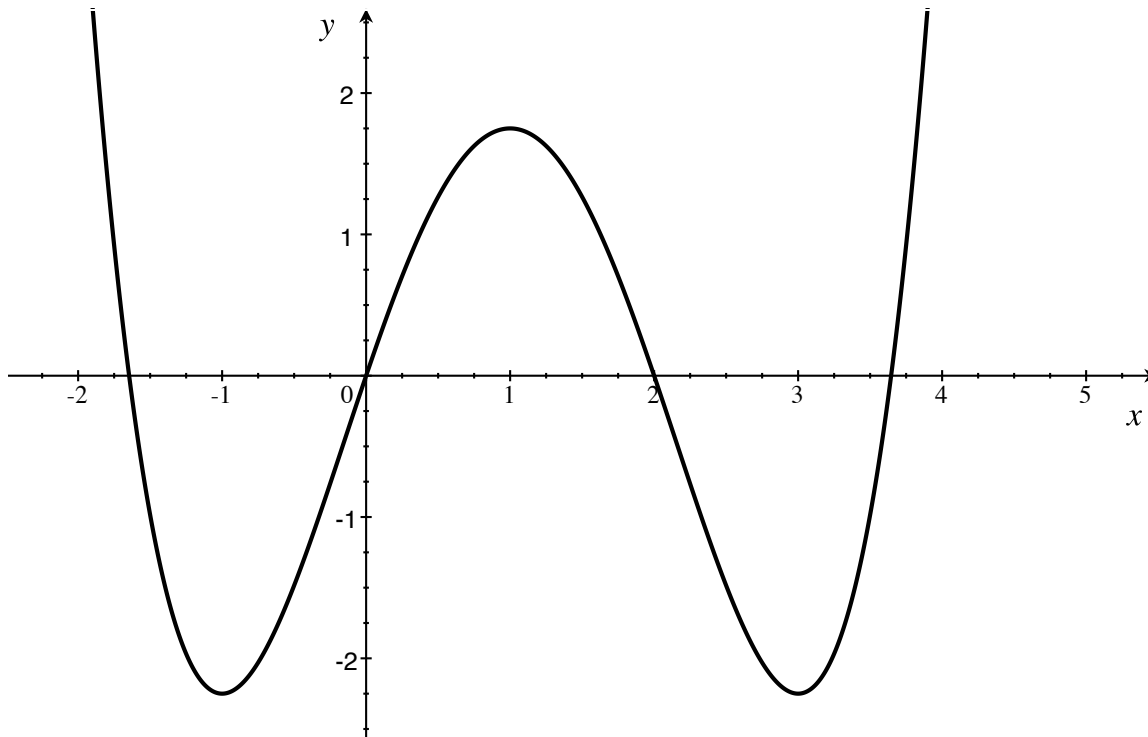
**The UC Davis Code of Academic Conduct**

I will conduct myself with honesty, fairness, and integrity.

Signature: \_\_\_\_\_

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- (1) Using the graph of  $f(x)$  below, decide where  $f(x)$  is increasing, where it is decreasing, where it is concave up, and where it is concave down.



(2) Suppose  $f(x) = x^5 - 5x^4 + 5x^3 + 17$ .

(a) Find the critical numbers of  $f(x)$ .

(b) Use the first derivative test to determine which critical numbers are relative maxima and which are relative minima.

(c) Use the second derivative test to determine which critical numbers are relative maxima and which are relative minima. Be sure to specify if and when the test fails!

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- (3) Find the maximum value attained by  $f(x)$  on the closed interval  $[0, 3]$ .

$$f(x) = \frac{x^2 - x + 1}{x^2 + 1}$$

- (4) Suppose you toss a coin straight up in the air at a rate of 16 ft/sec from an initial height of 5 ft. How long will it take the coin to reach its highest point?

- (5) A spaceship is launching from the ground at a rate of 25000 ft/sec. An observer watches from a safe 3000 ft away from the liftoff location. How fast is the distance between the observer and the space shuttle changing when the shuttle is 4000 ft from the ground?

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(6) Find the point on the graph  $y = \sqrt{2x}$  closest to the point  $(3, 0)$ .

**Trigonometric Identities**

$$\sin(A + B) = \sin(A) \cos(B) + \cos(A) \sin(B)$$

$$\sin(A - B) = \sin(A) \cos(B) - \cos(A) \sin(B)$$

$$\cos(A + B) = \cos(A) \cos(B) - \sin(A) \sin(B)$$

$$\cos(A - B) = \cos(A) \cos(B) + \sin(A) \sin(B)$$

$$\sin(2A) = 2 \sin(A) \cos(A)$$

$$\cos(2A) = \cos^2(A) - \sin^2(A)$$

$$\sin^2(A) + \cos^2(A) = 1$$

$$\tan^2(A) + 1 = \sec^2(x)$$

$$1 + \cot^2(A) = \csc^2(x)$$