

Directions: Round to 3 decimal places. Show all work.

1. The function f is given by $f(x) = x^4 + x^2 - 2$. On which of the following intervals is f increasing?

- a) $\left(-\frac{1}{\sqrt{2}}, \infty\right)$ b) $\left(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ c) $(-\infty, 0)$
- d) $(0, \infty)$ e) $\left(-\infty, \frac{1}{\sqrt{2}}\right)$
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2. What is the area of the largest rectangle with lower base on the x -axis and upper vertices on the curve $y = 12 - x^2$?

- a) 8 b) 12 c) 16 d) 32 e) 48
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3. The derivative of f is given by $f'(x) = e^x(-x^3 + 3x)$ for $0 < x < 5$.

At what value of x does $f(x)$ have a local minimum?

- a) 0 b) 0.618 c) 1.623
d) 5 e) For no value of x
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4. Find the equation of the line tangent to the graph of $y = 7x - x^2$ at the point where $f'(x) = 3$

- a) $y = 5x - 10$
b) $y = 3x + 4$
c) $y = 3x + 8$
d) $y = 3x - 10$
e) $y = 3x - 16$
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5. Find all the solutions to $\csc x = 2.4$

a) $x = .429 \pm 2\pi n$

b) $x = 2.712 \pm 2\pi n$

c) $x = 1.414 \pm 2\pi n$

d) $x = .429 \pm 2\pi n$ and $x = 1.414 \pm 2\pi n$

e) $x = .429 \pm 2\pi n$ and $x = 2.712 \pm 2\pi n$

6. $\lim_{x \rightarrow 0} \frac{5x^4 + 8x^2}{3x^4 - 16x^2} =$

a) $-\frac{1}{2}$

b) 0

c) 1

d) $\frac{5}{3}$

e) *dne*

7. The graph of $f(x) = \sec x$ can be obtained from the graph of $y = \sec x$ by applying, in order, a horizontal stretch by a factor of 2, a vertical stretch by a factor of 3, and a vertical shift down 3 units. The equation of f is.

a) $f(x) = -3 + 3\sec 2x$

b) $f(x) = -3 + 3\sec \frac{x}{2}$

c) $f(x) = 3 - 3\sec 2x$

d) $f(x) = 3 - 3\sec \frac{x}{2}$

e) None of the above

8. The amplitude of the graph of $y = 3 + 2\cos(x - \pi)$

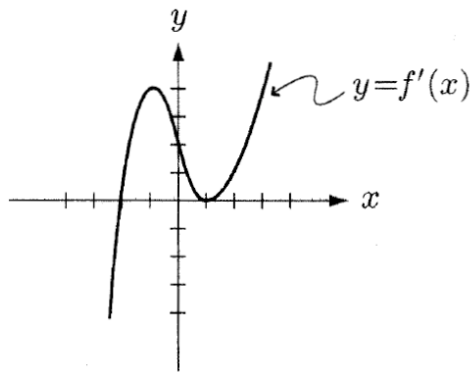
a) $\frac{\pi}{2}$

b) π

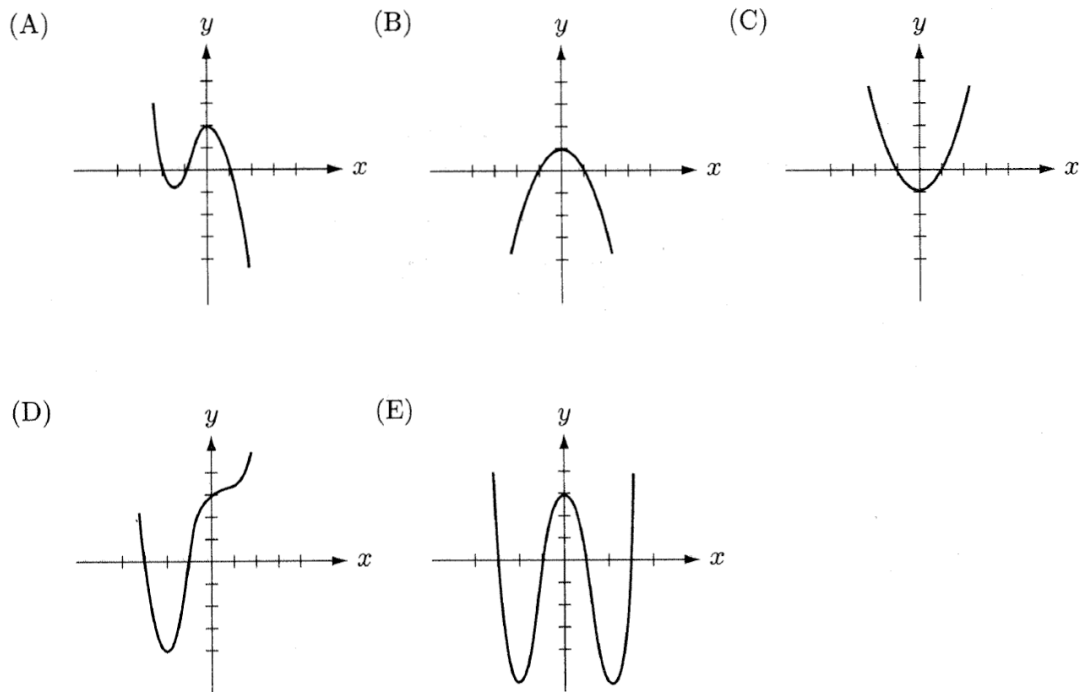
c) 2

d) 3

e) 2π



9. The graph of the derivative of f is shown above. Which of the following could be the graph of f ?



10. Let θ be the acute angle in standard position. If $\sin\theta = \frac{7}{15}$, then $\tan\theta =$

- a) $\frac{15}{7}$ b) $\frac{7\sqrt{11}}{44}$ c) $\frac{15\sqrt{11}}{44}$
d) $\frac{4\sqrt{11}}{15}$ e) $\frac{4\sqrt{11}}{7}$
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11. The graph of $y = 3x^2 - x^3$ has a relative maximum at

- a. (0, 0) only b. (1, 2) only c. (2, 4) only
d. (4, -16) only e. (0, 0) and (2, 4)
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12. What is the period of $y = \sin(6x)$?

- a) $\frac{\pi}{3}$ b) $\frac{2\pi}{3}$ c) 2π d) 6π e) 12π
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PreCalc Honors 15 -16

Name _____

Fall Final

CALCULATOR ALLOWED

Score _____

1. Solve $\sin\left(\frac{\pi}{3} - x\right) + 1 = \sin\left(x + \frac{\pi}{3}\right)$ exactly for $x \in [0, 4\pi]$

2. $D_x \left[8x^7 - 3x^2 + \frac{1}{x^7} - \frac{2}{\sqrt[9]{x^4}} + \pi^4 \right]$

3. Homer Simpson has accidentally stolen a nuclear submarine. If he travels at 27 miles on a bearing of 18° , then turns and goes 57 miles at a bearing of 85° , and finally travels 300 miles at 270° , what is his total displacement and direction?

4a. Find the zeros, algebraically, of $y = x^4 - 5x^3 - 15x^2 + 45x + 54$.

4b. Find the extreme points, graphically, of $y = x^4 - 5x^3 - 15x^2 + 45x + 54$.
Show the derivative before using your calculator.

5. Researchers find an extra-terrestrial being. In studying it, they find that its body temperature varies sinusoidally with time. 35 minutes after they start timing, the temperature is at its highest, which is 120°C . 20 minutes after it has reached its maximum, the temperature hits its minimum, which is 104°C .

(a) Sketch a graph of the temperature as a function of time.

(b) Write a sinusoidal equation that describes the temperature y in terms of t .

(c) What was the temperature when they started timing?

(d) What are the first three times that the temperature is 111°C ?

6. Find an inequality that has this sign pattern and solution:

$$\begin{array}{c} y \\ \leftarrow \begin{array}{ccccccc} + & 0 & - & 0 & - & 0 & + & 0 & + & 0 & - \\ -5 & -2 & \frac{1}{2} & 7 & 13 & & & & & & \end{array} \rightarrow \\ x \end{array} \text{ and } x \in (-5, -2) \cup \left(-2, \frac{1}{2}\right) \cup (13, \infty)$$

7. Sketch the primary cycle of $y = 5 + 2 \cot(4\pi x)$

8. Prove $1 + \sin(2x) = \frac{\sec^2 x + 2 \sin x \sec x}{1 + \tan^2 x}$

9. Find the traits and **sketch** of $y = x^4 - 5x^3 - 15x^2 + 45x + 54$.

Domain:

Range:

Y – Int:

End Behavior:

Zeros:

Extreme Values:

