

Name _____

- Calculators may only be used on problems 1–2.
 - A correct answer will only be given full credit if enough work is shown to justify that answer.
1. (6 points) Approximate the following limit. Your answer must be within 0.1 of the correct limit. This degree of accuracy should be easy to obtain if you use your calculator to make an appropriate table of values.

$$\lim_{x \rightarrow 4} \frac{30 \sin(x - 4)}{x^2 - 16}$$

2. (15 points) A rectangular lot adjacent to a road is to be enclosed by a fence that is 4 feet tall. The fence along the road is to be reinforced and costs \$7 per square foot. Fencing that costs \$5 per square foot can be used for the other three sides.

(a) Sketch a diagram of the rectangular lot and label the lengths of its sides with variables.

(b) Obtain a formula for the area of this lot as a function of the variables used in your diagram.

(c) Obtain a formula for the total cost of fencing as a function of the variables used in your diagram.

(d) Express the area that can be enclosed by this rectangular lot for a cost of \$14400 as a function of the length of the side along the road.

3. (10 points) Given that $f(x) = \frac{1}{x^2 - 9}$ and $g(x) = \sqrt{x - 2}$, find a *simplified* formula for $(f \circ g)(x)$ and state its domain.

4. (10 points) Find the natural domain of $f(x) = \sqrt{x^3 - 9x}$.

5. (12 points) Find the equation for the line which goes through the point $(0, 4)$ and is parallel to the line $\frac{x}{3} + \frac{y}{6} = 1$.

6. (6 points) Compute the value of $\tan\left(\frac{2\pi}{3}\right)$. Give the exact answer in simplified form.

7. (15 points) Complete the equations below to give the standard trigonometric identities.

(a) $\cos(\alpha - \beta) =$

(b) $\sin(\alpha - \beta) =$

(c) $\cos(2\alpha) =$

(d) $\sin(2\alpha) =$

(e) $\sin(\pi + \theta) =$

8. (6 points) Evaluate the following limits.

(a) $\lim_{x \rightarrow 3} \frac{x + 7}{x^2 - 4}$

(b) $\lim_{x \rightarrow 4^+} \frac{3}{x - 4}$

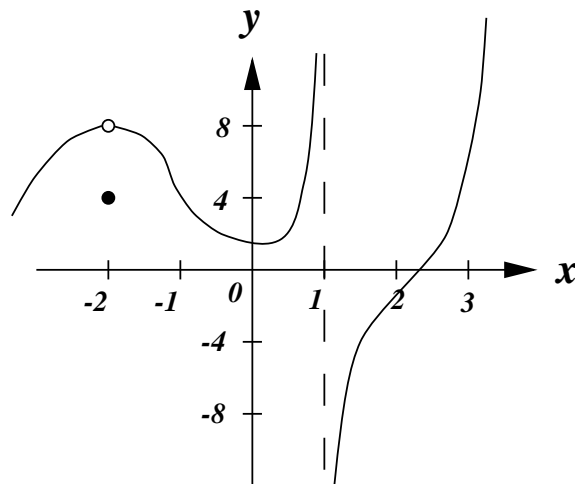
9. (6 points) Evaluate the following limit analytically (i.e., you will not receive credit for simply approximating the correct answer with a calculator.) Be sure to use proper notation.

$$\lim_{x \rightarrow 1} \frac{x^2 - 1}{x^2 + x - 2}$$

10. (6 points) Sketch one possible graph for a function f which has all of the specified properties.

- $f(0) = 4$
- $\lim_{x \rightarrow 2} f(x) = +\infty$
- $\lim_{x \rightarrow -\infty} f(x) = 2$
- $\lim_{x \rightarrow +\infty} f(x) = -2$

11. (8 points) The graph of $f(x)$ has a vertical asymptote at $x = 1$ as shown below. Evaluate the following quantities.



(a) $\lim_{x \rightarrow -2} f(x)$

(b) $f(-2)$

(c) $\lim_{x \rightarrow 1^-} f(x)$

(d) $\lim_{x \rightarrow 1^+} f(x)$