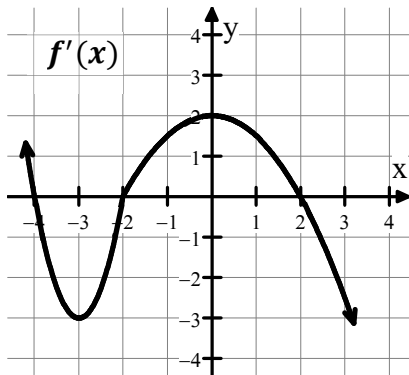# 5.3 Increasing and Decreasing Intervals

Calculus

Name: _____

The following graphs show the derivative of f, f'. Identify the intervals when f is increasing and decreasing. Include a justification statement.
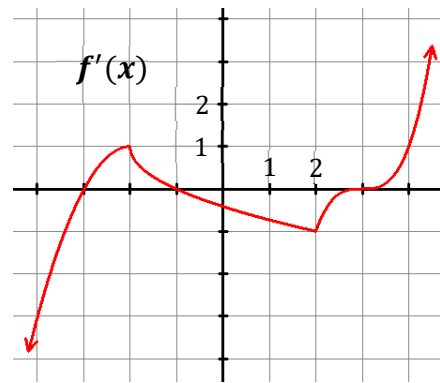
1.

$f'(x)$

Increasing:

Decreasing:

2.

$f'(x)$

Increasing:

Decreasing:

For each function, find the intervals where it is increasing and decreasing, and JUSTIFY your conclusion. Construct a sign chart to help you organize the information, but do not use a calculator.

3. $f(x) = \frac{1}{2}x - \sin x$ on the interval $[0, 2\pi]$

4. $h(x) = -2x^3 + 6x^2 - 3$

5. $f(x) = \frac{9x}{x^2+9}$

The derivative f' is given for each problem. Use a calculator to help you answer each question about f.

6. $f'(x) = \frac{-4x}{(x^2+1)^2}$. On what interval(s) is f increasing?

7. $f'(x) = (\cos x)e^x - e^x \sin x$ on the interval $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$. On what interval(s) is f decreasing?

8. The height of a buoy, where $h = 0$ is the height during calm waters, is measured on the ocean during a storm. The height can be modeled by $h(t) = 6\sin(0.2t)$ where t is measured in seconds and $h(t)$ is measured in feet. Is the buoy's height increasing or decreasing at time $t = 30$ seconds.

9. A local wild boar population is changing at a rate modeled by $b(t) = .05t^4 - .2t^2 - .01t$ boar per year where t is measured in years. Is the boar population growing or shrinking at time $t = 2$ years? Justify your answer.

Answers to 5.3 CA #2

1. Increasing on $(-\infty, -4)$ and $(-2, 2)$ because $f'(x) > 0$. Decreasing on $(-4, -2)$ and $(2, \infty)$ because $f'(x) < 0$.	2. Increasing on $(-3, -1)$ and $(3, \infty)$ because $f'(x) > 0$. Decreasing on $(-\infty, -3)$ and $(-1, 3)$ because $f'(x) < 0$	3. Increasing on $\left(\frac{\pi}{3}, \frac{5\pi}{3}\right)$ because $f'(x) > 0$. Decreasing on $\left(0, \frac{\pi}{3}\right)$ and $\left(\frac{5\pi}{3}, 2\pi\right)$ because $f'(x) < 0$.
4. Increasing on $(0, 2)$ because $f'(x) > 0$. Decreasing on $(-\infty, 0)$ and $(2, \infty)$ because $f'(x) < 0$.	5. Increasing on $(-3, 3)$ because $f'(x) > 0$. Decreasing on $(-\infty, -3)$ and $(3, \infty)$ because $f'(x) < 0$.	6. $(-\infty, 0)$
7. $\left(-0.785, \frac{\pi}{2}\right)$	8. $h'(30) \approx 1.152$. Increasing because $h'(30) > 0$.	9. $b(2) \approx -0.02$ Shrinking because $b(2) < 0$.