

Name: _____

MA2 Exam 1 Practice

Do and show all work on this paper. All problems must be answered using calculus techniques. Put a box around your final answers. *Scientific calculators* are permitted, but *graphing calculators* are not permitted on this exam.

1. Find the equation of the normal line to the curve $f(x) = x^2 - 20x + 18$ at $x = 5$.

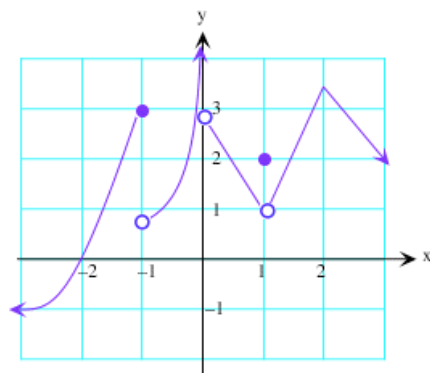
2. If $h(x) = x^5 \sec\left(\frac{1}{x}\right)$, find $h'\left(\frac{3}{\pi}\right)$, expressed in simplest form in terms of π .

3. Determine if the following function is continuous at $x = 0$:

$$f(x) = \begin{cases} \frac{x-6}{x-3}, & \text{if } x < 0 \\ 2, & \text{if } x = 0 \\ \sqrt{4+x^2}, & \text{if } x > 0 \end{cases}$$

4. The graph at the right shows $f(x)$ on the interval $[-3, 3]$.
State all values of x on $[-3, 3]$ for which

- a) $f(x)$ is undefined.
- b) $\lim f(x)$ does not exist.
- c) $f(x)$ is discontinuous.
- d) $f'(x) = 0$.
- e) $f'(x)$ does not exist.



5. Given $f(x) = 4x^3 - 7x^2 + 2$

- a) For what values of x is $f(x)$ increasing?
- b) For what values of x is $f(x)$ decreasing?
- c) For what values of x is $f(x)$ concave up?
- d) For what values of x is $f(x)$ concave down?
- e) State the x -coordinate of the relative minimum.
- f) State the x -coordinate of the point of inflection.

6. The spherical volume of a cancer tumor is given by $V = \frac{4}{3}\pi r^3$, where r is the radius of the tumor in centimeters.

- a) Find the volume when the radius is 2 cm.
- b) Find the instantaneous rate of change of the volume with respect to change in the radius.
- c) Find the growth rate of the tumor when the radius is 2 cm.

7. Find $\frac{d^2y}{dx^2}$ if $y = x \cos 5x - \sin^2 x$.

8. Find $\frac{dy}{dx}$ using the definition of the derivative if $y = \sqrt{2x+1}$.

9. Find $f'(x)$ if $f(x) = \frac{\sec x}{\tan^2 x}$.

10. Find the equation of the line tangent to the curve $(2x^2 + 3y)^2 - 4xy = 4$ at $(1, 0)$.