

Student # \_\_\_\_\_

MAT1320 C Test I

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Total

Question 1. [1 point] Simplify  $e^{5 \ln x}$ .

Answer:  $x^5$

Question 2. [1 point] Simplify

$$\sin^{-1}(\sin(x)) - x + 10$$

if  $x$  is in  $[-\frac{\pi}{2}, \frac{\pi}{2}]$ .

$$x - x + 10$$

Answer: 10

Question 3. [1 point] The function  $f(x) = |x + 1|$  is differentiable everywhere.

Answer: True

False

*The function is not diff. at  $x = -1$*

Question 4. [1 point] If  $g(x) = \sin(10x - 1)$ , what is  $g^{-1}(x)$ ?

Answer:  $g^{-1}(x) = \frac{(\sin x + 1)/10}$

$$y = \sin^{-1}(10x - 1) \rightarrow \sin y = 10x - 1$$

$$x = \frac{\sin y + 1}{10}$$

Question 5. [1 point] Is

$$f(x) = \begin{cases} \frac{x+10}{x^2+5} & x \neq 0 \\ 2 & x = 0 \end{cases}$$

continuous at  $x = 0$ ?

Answer: Yes

No

$$\lim_{x \rightarrow 0} \frac{x+10}{x^2+5} = \frac{10}{5} = 2$$

Student # \_\_\_\_\_

MAT1320 C Test I

**Question 6.** [1 points] A particle moves according to a law of motion  $f(t) = t^4 - 4t + 1$ ,  $t \geq 0$  where  $t$  is measured in seconds and  $f$  in feet. What is the velocity after 2 seconds (in ft./sec.)?

$$f'(t) = 4t^3 - 4 \quad f'(2) = 4(2^3) - 4 = 28$$

Answer: 28

**Question 7.** [3 points] Use the definition of the derivative to find  $f'(x)$  if  $f(x) = \sqrt{x-1}$ .

$$\begin{aligned} f'(x) &= \lim_{h \rightarrow 0} \frac{\sqrt{x+h-1} - \sqrt{x-1}}{h} \stackrel{0/0}{=} \lim_{h \rightarrow 0} \frac{\sqrt{x+h-1} - \sqrt{x-1}}{h} \cdot \frac{\sqrt{x+h-1} + \sqrt{x-1}}{\sqrt{x+h-1} + \sqrt{x-1}} \\ &= \lim_{h \rightarrow 0} \frac{(x+h-1) - (x-1)}{h(\sqrt{x+h-1} + \sqrt{x-1})} = \lim_{h \rightarrow 0} \frac{1}{\sqrt{x+h-1} + \sqrt{x-1}} \\ &= \frac{1}{2\sqrt{x-1}} \end{aligned}$$

Student # \_\_\_\_\_

MAT1320 C Test I

**Question 8.** [3 points] Determine the following limits. If a limit does not exist, determine if it is  $\infty$ ,  $-\infty$  or neither.

a)  $\lim_{x \rightarrow \infty} \frac{\pi + 3x}{\pi x - 10} = \frac{\infty}{\infty}$

$$\lim_{x \rightarrow \infty} \frac{x(\frac{\pi}{x} + 3)}{x(\pi - \frac{10}{x})} = \lim_{x \rightarrow \infty} \frac{\frac{\pi}{x} + 3}{\pi - \frac{10}{x}} = \frac{0 + 3}{\pi - 0} = \frac{3}{\pi}$$

b)  $\lim_{x \rightarrow -2^-} \frac{x-2}{x^2-4} = \lim_{x \rightarrow -2^-} \frac{x-2}{(x-2)(x+2)} = \lim_{x \rightarrow -2^-} \frac{1}{x+2} = \frac{1}{0^-} = -\infty$

$x$	$-2$
$x+2$	$- \quad 0 \quad +$

Student # \_\_\_\_\_

MAT1320 C Test I

**Question 9.** [3 points] Find the first derivative of the following functions. Do NOT simplify.

a)  $h(x) = 5e^x (x^2 + 1)$

$$h'(x) = 5e^x (x^2 + 1) + 5e^x (2x + 0)$$

b)  $g(x) = \frac{x^2 + 3x + 1}{x + 1}$

$$g'(x) = \frac{(2x + 3)(x + 1) - (x^2 + 3x + 1)(1)}{(x + 1)^2}$$