

# Make-up Midterm Exam

⚠ This is a preview of the published version of the quiz

Started: Nov 25 at 6:10am

## Quiz Instructions

Functions to type in if needed:

$\text{sqrt}(x)$ : square root function;  $\text{\infty}$ : infinity

$\text{sin}(x)$ : sine function;  $-\text{\infty}$ : minus infinity

$\text{cos}(x)$ : cosine function;  $(a,b) \cup (c,d)$ : union of intervals

$e^x$ : exponential function;  $\theta$ : angle theta

$\ln(x)$ : logarithmic function;  $\pi$ : the number pi

$\leq$ : less equal than;  $\geq$ : greater equal than

### Question 1

2 pts

Find the constant  $C$  of the antiderivative  $f$ , if  $f'(x) = e^{x/3} + 20(1 + x^2)^{-1}$  with  $f(0) = 2$ .

**Question 2****3 pts**

Use the Newton's approximation method to find the root (correct to 5 decimal places) of the equation  $x^3 - 2x + 3 = 0$  with the initial  $x = -2$ .

**Question 3****3 pts**

Find the point on the parabola  $y^2 = 2x$  that is closest to the point  $A \left( 1, \frac{27}{2} \right)$ .

Hint: Type your answer in the form  $(x, y)$  of an ordered pair.

**Question 4****4 pts**

Suppose the function  $g(x) = 200 + 8x^3 + x^4$ . Give the first and second derivative in a simplified form.

Hint: Type in your answer in the form  $g'(x)=ax^b(A-x)(B-x)(C+x)$ ;  $g''(x)=ax^b(A-x)(B-x)(C+x)$

**Question 5****2 pts**

Suppose the function  $g(x) = 200 + 8x^3 + x^4$ . Find the intervals of increase or decrease.

Hint: Type in your answer in the form **decrease in (a,b)**; **increase in (c,d)**

**Question 6****3 pts**

Suppose the function  $g(x) = 200 + 8x^3 + x^4$ . Find the inflection points (IP) and the intervals of concavity.

Hint: Type in your answer in the form IP: x,y; concave up in (a,b); concave down in (c,d)

### Question 7

2 pts

Suppose the function  $g(x) = 200 + 8x^3 + x^4$ . Find the local maximum and minimum values.

Hint: Type in your answer in the form maximum: (x,f(x)); minimum: (x,f(x)) or minimum: does not exist

### Question 8

3 pts

An object with weight  $W$  is dragged along a horizontal plane by a force acting along a rope attached to the object. If the rope makes an angle with the plane, then the magnitude of the force is  $F = \frac{\mu W}{\mu \sin(\theta) + \cos(\theta)}$ , where  $\mu$  is a positive constant called the *coefficient of friction* and where  $0 \leq \theta \leq \pi/2$ . Determine the type of the critical point  $\tan(\theta) = \mu$ .

☐  $F'' = W \cos(\theta) > 0$ , maximum

☐  $F'' = W \sin(\theta) > 0$ , minimum

☐  $F'' = 0$ , inflection point

☐  $F'' = W \sin(\theta) < 0$ , minimum

### Question 9

1 pts

If  $f$  is odd, then  $f'$  is even.

☐ False

☐ True

### Question 10

1 pts

$$\sqrt{4n+1} - 3$$



Find the limit  $\lim_{u \rightarrow 2} \frac{u^3 - 8}{u - 2}$ .

### Question 11

2 pts

Find  $y'$  if  $x^3 + y^4 = 3xy$ .

☐  $y' = \frac{3(x^2 - y^2)}{3x - 4y^2}$

☐  $y' = \frac{2(x^2 + y)}{3x - 4y^3}$

☐  $y' = \frac{3(x^2 - 2y)}{3x - 2y^3}$

☐  $y' = \frac{3(x^2 - y)}{3x - 4y^3}$

### Question 12

2 pts

Find the tangent to  $x^3 + y^4 = 3xy$  at the point  $(3, 3)$ .

☐  $11y = -2x + 39$

☐  $2y = 11x - 39$

☐  $12y = -5x + 31$

☐  $y = \frac{1}{11}x - \frac{38}{11}$

**Question 13****2 pts**

Find the limit  $\lim_{x \rightarrow 0^+} \left( \frac{1}{x} - \frac{1}{e^x - 1} \right)$

Quiz saved at 6:10am

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