Student: _____ **Instructor:** Oscar Bandtlow **Assignment:** Final exam (20 questions) unpooled
Date: _____ **Course:** MTH4100 / MTH4200 - Calculus I - 2020/21

1. Find an equation of the tangent to the curve $f(x) = \sqrt{x+8}$ that has slope $\frac{1}{4}$.

- (●) **A.** $y = \frac{1}{4}x + 3$
- ( ) **B.** $y = \frac{1}{4}x$
- ( ) **C.** $y = -\frac{1}{4}x + 3$
- ( ) **D.** $y = \frac{1}{4}x - 3$

ID: 3.1-28

2. Evaluate the integral using integration by parts.

$$\int 2x^4 e^{-2x}\,dx$$

$\int 2x^4 e^{-2x}\,dx =$ $-\left(x^4 + 2x^3 + 3x^2 + 3x + \frac{3}{2}\right) e^{-2x} + C$

ID: 8.2.16

3. Express the given quantity in terms of **sin** x or **cos** x.

sin $(2\pi - x)$

- ( ) **A.** **sin** x
- ( ) **B.** **cos** x − **sin** x
- ( ) **C.** **cos** x
- (●) **D.** **− sin x**

ID: 1.3-31

4. Find the limit.

$$\lim_{x \to -5^-} (x+3)\left(\frac{|x+5|}{x+5}\right)$$

- ( ) **A.** −2
- ( ) **B.** 8
- (●) **C.** **2**
- ( ) **D.** The limit does not exist.

ID: 2.4-10

5. Express the given quantity in terms of **sin** x or **cos** x.

cos $\left(\frac{7\pi}{2} + x\right)$

- ( ) **A.** **cos** x
- ( ) **B.** **− sin** x
- (●) **C.** **sin x**
- ( ) **D.** **cos** x + **sin** x

ID: 1.3-29

6. Use l'Hôpital's Rule to find the following limit.

$$\lim_{h \to 0} \frac{e^{5h} - (1+5h)}{3h^2}$$

$\lim_{h \to 0} \frac{e^{5h} - (1+5h)}{3h^2} =$ $\frac{25}{6}$ (Type an exact answer.)

ID: 7.5.44

7. Find an equation of the tangent to the curve $f(x) = 2x^2 - 2x + 1$ that has slope 2.

- A. $y = 2x + 1$
- **B. $y = 2x - 1$**
- C. $y = 2x$
- D. $y = 2x + 2$

ID: 3.1-29

8. Determine whether the improper integral converges or diverges.

$$\int_1^{\infty} \frac{\sqrt{5x+2}}{x^2}\,dx$$

- **Converges**
- Diverges

ID: 8.8-32

9. Evaluate the improper integral or state that it is divergent.

$$\int_4^{\infty} \frac{dt}{t^2 - 3t}$$

- A. $3 \ln 4$
- B. $\frac{1}{4} \ln 3$
- C. $-\frac{1}{3} \ln 4$
- **D. $\frac{1}{3} \ln 4$**
- E. The integral is divergent.

ID: 8.8-2

10. Find y''.

$y = 4 \cot\left(\frac{x}{9}\right)$

- A. $-8 \csc\left(\frac{x}{9}\right)$
- B. $-\frac{4}{9}\csc^2\left(\frac{x}{9}\right)$
- **C. $\frac{8}{81} \csc^2\left(\frac{x}{9}\right) \cot\left(\frac{x}{9}\right)$**
- D. $8 \csc^2\left(\frac{x}{9}\right) \cot\left(\frac{x}{9}\right)$

ID: 3.6-23

11. Evaluate the integral using integration by parts.

$$\int 3x^3 e^{5x}\,dx$$

$$\int 3x^3 e^{5x}\,dx = \left(\frac{3}{5}x^3 - \frac{9}{25}x^2 + \frac{18}{125}x - \frac{18}{625}\right) e^{5x} + C$$

ID: 8.2.15

12. Find the limit.

$\lim_{x \to \infty} (4x - \sqrt{16x^2 - 4x + 6})$

- A. 0
- B. -12
- C. **$\frac{1}{2}$**
- D. $-\infty$

ID: 2.6-20

13. Find the average value of the function over the given interval.

$f(x) = |x| + 4$ on $[-5, 5]$

- A. 13
- B. 65
- C. $\frac{13}{10}$
- D. **$\frac{13}{2}$**

ID: 5.3-40

14. Find the derivative of y with respect to the appropriate variable.

$y = \cosh^{-1} 2\sqrt{x + 9}$

- A. $\frac{1}{\sqrt{(2x + 17)(x + 9)}}$
- B. **$\frac{1}{\sqrt{(4x + 35)(x + 9)}}$**
- C. $\frac{1}{\sqrt{(2x + 17)}}$
- D. $\frac{1}{\sqrt{(4x + 37)(x + 9)}}$

ID: 7.7-21

15. Find the function y(x) satisfying $\frac{dy}{dx} = 5x^{-4/5}$ and $y(-1) = -2$.

The function y(x) satisfying $\frac{dy}{dx} = 5x^{-4/5}$ and $y(-1) = -2$ is $y(x) =$ **$25x^{1/5} + 23$** .

ID: 4.7.75

16. Find the limit and determine if the function is continuous at the point being approached.

$\lim_{x \to \pi/2} \cos(5x - \cos 5x)$

- A. The limit is -1 and the function is not continuous at the point.
- B. The limit is 0 and the function is not continuous at the point.
- C. The limit is -1 and the function is continuous at the point.
- D. **The limit is 0 and the function is continuous at the point.**
- E. The limit does not exist and the function is not continuous at the point.

ID: 2.5-21

17. Find y''.

$y = (\sqrt{x} - 9)^{-3}$

- **A.** $\frac{3}{4x}(\sqrt{x} - 9)^{-5}\left(-\frac{9}{\sqrt{x}} + 5\right)$
- **B.** $6(\sqrt{x} - 9)^{-5}$
- **C.** $-\frac{3}{2x}(\sqrt{x} - 9)^{-5}\left(\frac{9}{\sqrt{x}} - 3\right)$
- **D.** $-\frac{3}{2\sqrt{x}}(\sqrt{x} - 9)^{-4}$

ID: 3.6-21

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18. Find f such that $f'(x) = 5x^2 + 5x - 5$ and $f(0) = 5$.

$f(x) = \frac{5}{3}x^3 + \frac{5}{2}x^2 - 5x + 5$

ID: 4.7.74

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19. Evaluate the integral.

$$\int \frac{2}{\sqrt{x}(7 + 2\sqrt{x})^2}\,dx$$

$$\int \frac{2}{\sqrt{x}(7 + 2\sqrt{x})^2}\,dx = -\frac{2}{7 + 2\sqrt{x}} + C$$

ID: 5.5.21

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20. Evaluate the integral.

$$\int_4^9 \frac{t^2 + 1}{\sqrt{t}}\,dt$$

- **A.** $\frac{432}{5}$
- **B.** $\frac{216}{5}$
- **C.** $\frac{864}{5}$
- **D.** 432

ID: 5.4-4

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21. Determine whether the improper integral converges or diverges.

$$\int_{-\infty}^{\infty} \frac{dx}{\sqrt{3x^4 + 1}}$$

- Diverges
- **Converges**

ID: 8.8-33

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22. Evaluate the integral.

$$\int 2y^8\sqrt{3 - 2y^9}\,dy$$

$$\int 2y^8\sqrt{3 - 2y^9}\,dy = -\frac{2}{27}(3 - 2y^9)^{3/2} + C$$

ID: 5.5.20

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23. Identify the coordinates of any local and absolute extreme points and inflection points. Graph the function.

$y = 8x - 8\sin x,\ 0 \le x \le 2\pi$

Identify the coordinates of the local maximum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** **The local maximum point(s) is/are $(2\pi, 16\pi)$.**
  (Type an ordered pair. Type an exact answer in terms of π. Use a comma to separate answers as needed. Do not use commas in the individual coordinates.)
- **B.** There are no local maximum points.

Identify the coordinates of the local minimum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** **The local minimum point(s) is/are $(0,0)$.**
  (Type an ordered pair. Type an exact answer in terms of π. Use a comma to separate answers as needed. Do not use commas in the individual coordinates.)
- **B.** There are no local minimum points.

Identify the coordinates of the absolute maximum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** **The absolute maximum point(s) is/are $(2\pi, 16\pi)$.**
  (Type an ordered pair. Type an exact answer in terms of π. Use a comma to separate answers as needed. Do not use commas in the individual coordinates.)
- **B.** There are no absolute maximum points.

Identify the coordinates of the absolute minimum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

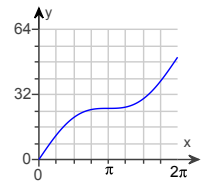
- **A.** **The absolute minimum point(s) is/are $(0,0)$.**
  (Type an ordered pair. Type an exact answer in terms of π. Use a comma to separate answers as needed. Do not use commas in the individual coordinates.)
- **B.** There are no absolute minimum points.

Identify the coordinates of any inflection points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

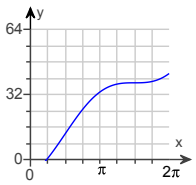
- **A.** **The function has an inflection point at $(\pi, 8\pi)$.**
  (Type an ordered pair. Type an exact answer in terms of π. Use a comma to separate answers as needed. Do not use commas in the individual coordinates.)
- **B.** The function has no inflection points.

Choose the correct graph of $y = 8x - 8\sin x$.

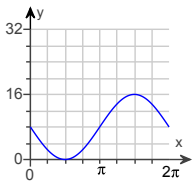
- **A.**



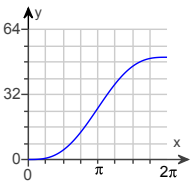
- **B.**



- **C.**



- **D.**



ID: 4.4.24

24. Use the substitution formula to evaluate the integral.

$$\int_0^{\pi/2} \frac{\cos x}{(3 + 4\sin x)^3}\,dx$$

- **A.** $-\frac{1}{9}$
- **B.** $\frac{5}{441}$
- **C.** $-\frac{20}{441}$
- **D.** $\frac{20}{441}$

ID: 5.6-8

25. Identify the coordinates of any local and absolute extreme points and inflection points. Graph the function.

$y = 3\sqrt{3}x + 6\cos x,\ 0 \le x \le 2\pi$

Identify the coordinates of the local maximum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** **The local maximum point(s) is/are** $\left(2\pi, 6\sqrt{3}\pi + 6\right), \left(\frac{\pi}{3}, \sqrt{3}\pi + 3\right)$.
  (Type an ordered pair. Use a comma to separate answers as needed. Type an exact answer, using π as needed.)
- **B.** There are no local maximum points.

Identify the coordinates of the local minimum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** **The local minimum point(s) is/are** $(0,6), \left(\frac{2\pi}{3}, 2\sqrt{3}\pi - 3\right)$.
  (Type an ordered pair. Use a comma to separate answers as needed. Type an exact answer, using π as needed.)
- **B.** There are no local minimum points.

Identify the coordinates of the absolute maximum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** **The absolute maximum point(s) is/are** $\left(2\pi, 6\sqrt{3}\pi + 6\right)$.
  (Type an ordered pair. Use a comma to separate answers as needed. Type an exact answer, using π as needed.)
- **B.** There are no absolute maximum points.

Identify the coordinates of any absolute minimum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

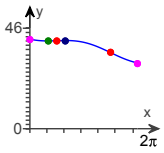
- **A.** **The absolute minimum point(s) is/are** $(0,6)$.
  (Type an ordered pair. Use a comma to separate answers as needed. Type an exact answer, using π as needed.)
- **B.** There are no absolute minimum points.

Find the inflection points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

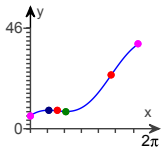
- **A.** **The inflection point(s) is/are** $\left(\frac{\pi}{2}, \frac{3\sqrt{3}\pi}{2}\right), \left(\frac{3\pi}{2}, \frac{9\sqrt{3}\pi}{2}\right)$.
  (Type an ordered pair. Use a comma to separate answers as needed. Type an exact answer, using π as needed.)
- **B.** There are no inflection points.

Choose the correct graph below.

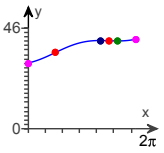
A.



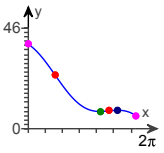
B.



C.



D.



ID: 4.4.25

26. Find the domain and range of the function.

$g(z) = \sqrt{4 - z^2}$

- **A.** D: $(-\infty, \infty)$, R: (0,2)
- **B.** D: $(-2, 2)$, R: $(-2, 2)$
- **C.** D: $[0, \infty)$, R: $(-\infty, \infty)$
- **D.** **D: $[-2, 2]$, R: $[0, 2]$**

ID: 1.1-7

27. Find the domain and range of the function.

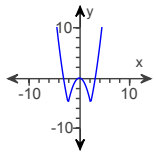
$g(z) = \frac{-9}{\sqrt{z+1}}$

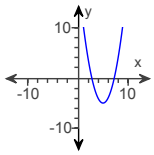
- **A.** **D: $(-1, \infty)$, R: $(-\infty, 0)$**
- **B.** D: $[1, \infty)$, R: $(-\infty, \infty)$
- **C.** D: $(-\infty, -1)$, R: $(0, \infty)$
- **D.** D: $[0, \infty)$, R: $(-\infty, \infty)$

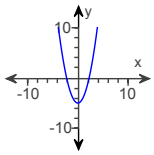
ID: 1.1-5

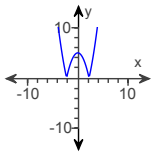
28. Graph the function.

$y = |x^2 - 5|$

A. 

B. 

C. 

D. 

ID: 1.2-44

29. Find the average value of the function over the given interval.

$f(x) = 3 - |x|$ on $[-3, 3]$

A. $\frac{3}{2}$

B. $\frac{3}{4}$

C. 3

D. 9

ID: 5.3-41

30. Use the substitution formula to evaluate the integral.

$$\int_{\pi/4}^{3\pi/4} (4 + \cot\theta)\csc^2\theta \, d\theta$$

A. **8**

B. 4

C. 16

D. -4

ID: 5.6-7

31. Find the derivative of y with respect to the appropriate variable.

$y = (5 - 5\theta)\tanh^{-1}\theta$

A. $\frac{5}{1-\theta} - 5\tanh^{-1}\theta$

B. $\frac{-5}{1+\theta}$

C. $\frac{5+5\theta}{1+\theta^2} - 5\tanh^{-1}\theta$

D. $\frac{5}{1+\theta} - 5\tanh^{-1}\theta$

ID: 7.7-22

32. Find the limit.

$$\lim_{x \to -1^+} (x+4)\left(\frac{|x+1|}{x+1}\right)$$

A. 5

B. -3

C. **3**

D. The limit does not exist.

ID: 2.4-9

33. Use l'Hôpital's Rule to find the following limit.

$$\lim_{x\to 0} \frac{\sin(x) - x}{6x^3}$$

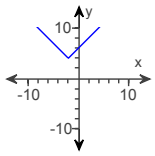
$\lim_{x\to 0} \frac{\sin(x) - x}{6x^3} =$ $-\frac{1}{36}$ (Type an exact answer.)

ID: 7.5.16

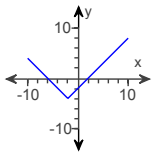
34. Graph the function.

$y = |x - 2| + 4$

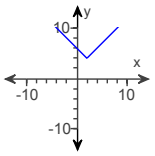
A.



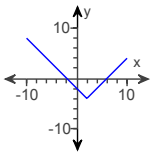
B.



C.



D.



ID: 1.2-34

35. Find the limit.

$$\lim_{x\to\infty} \sqrt{x^2 + 6x} - x$$

A. ∞
B. 3
C. 0
D. 6

ID: 2.6-21

36. Evaluate the integral.

$$\int_1^2 \left(t + \frac{1}{t}\right)^2 dt$$

A. $\frac{29}{6}$
B. $\frac{15}{2}$
C. $\frac{5}{6}$
D. $\frac{37}{6}$

ID: Instructor-created question

37. Find the limit and determine if the function is continuous at the point being approached.

$$\lim_{x\to -2\pi} \sin\left(\frac{5\pi}{2}\cos(\tan x)\right)$$

A. **The limit is 1 and the function is continuous at the point.**
B. The limit is 1 and the function is not continuous at the point.
C. The limit is -1 and the function is continuous at the point.
D. The limit is -1 and the function is not continuous at the point.
E. The limit does not exist and the function is not continuous at the point.

ID: 2.5-22

38. Evaluate the integral.

$$\int_{-1}^{3/2} \frac{8\ dt}{\sqrt{24 - 2t - t^2}}$$

- (●) **A.** $\frac{4}{3}\pi$
- ( ) **B.** $\frac{8}{3}\pi$
- ( ) **C.** $\frac{\sqrt{2}}{2} - \pi$
- ( ) **D.** $\frac{\pi}{6}$

ID: 7.6-30