

1. (5 pts.) Evaluate $\lim_{x \rightarrow 0} x^{10} \cos\left(\frac{10}{x}\right)$.
- 10
 - 1
 - $-\infty$
 - 0
 - ∞
2. (5 pts.) If $f(x)$ and $g(x)$ are continuous functions with $f(6) = 3$ and $\lim_{x \rightarrow 6} [5f(x) - g(x)] = 4$, find $g(6)$.
- 19
 - 3
 - 11
 - 5
 - 4
3. (5 pts.) A curve has the equation $y = g(x)$. Find an expression for the slope of the secant line through the points $P(2, g(2))$ and $Q(x, g(x))$.
- $\frac{g(2) - g(x)}{x - 2}$
 - $\frac{g(x) - g(2)}{2 - x}$
 - $\frac{g(x) - g(2)}{x - 2}$
 - $\frac{g(2) - x}{g(x) - 2}$
 - $\frac{g(x) - 2}{g(2) - x}$
4. (5 pts.) A particle moves along a straight line with equation of motion $f(t) = t^2 - 5t - 4$ where $f(t)$ is measured in meters and t in seconds. Find the velocity when $t = 6$.
- 1 m/s
 - 7 m/s
 - 18 m/s
 - 6 m/s
 - 4 m/s
5. (5 pts.) Differentiate $f(x) = \frac{\sqrt{5}}{x^5}$.
- $\frac{df}{dx} = \frac{5\sqrt{5}}{x^6}$
 - $\frac{df}{dx} = -\frac{5\sqrt{5}}{x^4}$
 - $\frac{df}{dx} = -\frac{5\sqrt{5}}{x^6}$
 - $\frac{df}{dx} = 5\sqrt{5}x^4$
 - $\frac{df}{dx} = -5\sqrt{5}x^6$
6. (5 pts.) Differentiate $y = \frac{\tan x - 4}{\sec x}$.
- $\frac{dy}{dx} = \cos x + \sin x$
 - $\frac{dy}{dx} = 4 \cos x - \sin x$
 - $\frac{dy}{dx} = 4 \cos x + \sin x$
 - $\frac{dy}{dx} = \cos x - \sin x$
 - $\frac{dy}{dx} = \cos x + 4 \sin x$
7. (5 pts.) If $f(x) = \frac{\sqrt{6 - x^2}}{x}$, find $f'(x)$.
- $f'(x) = \frac{-6}{x\sqrt{6 - x^2}}$
 - $f'(x) = \frac{1}{x\sqrt{6 - x^2}}$
 - $f'(x) = \frac{-6}{x^2\sqrt{6 - x^2}}$
 - $f'(x) = \frac{-1}{x^2\sqrt{6 - x^2}}$
 - $f'(x) = \sqrt{-2x}$
8. (5 pts.) Find an equation of the tangent line to the curve $4x^2 + 5y^2 = 9$ at the point $(1, 1)$.
- $y = -\frac{4}{5}x + \frac{14}{5}$
 - $y = -\frac{9}{5}x + \frac{9}{5}$
 - $y = 4x + 14$
 - $y = \frac{1}{5}x + \frac{9}{5}$
 - $y = -\frac{4}{5}x + \frac{9}{5}$

9. (5 pts.) If $f(x) = (1 - 7x)^{-\frac{1}{2}}$, find $f''(0)$.

- a) $\frac{49}{2}$
- b) $\frac{4}{147}$
- c) $\frac{147}{4}$
- d) $-\frac{49}{2}$
- e) $\frac{7}{2}$

13. (5 pts.) Evaluate $\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 10x}}{10x + 1}$.

- a) $\frac{1}{5}$
- b) 1
- c) $\frac{1}{2}$
- d) ∞
- e) $\frac{1}{10}$

10. (5 pts.) Find the absolute minimum value of $y = 2x^2 - 20x + 2$ on the interval $[0, 6]$.

- a) 20
- b) -50
- c) -48
- d) 5
- e) 0

14. (5 pts.) Given that the graph of $f(x)$ passes through the point $(1, 0)$ and that the slope of its tangent line at $(x, f(x))$ is $2x - 5$, find $f(2)$.

- a) -2
- b) -4
- c) 2
- d) -6
- e) -5

11. (5 pts.) Find the absolute maximum of the function $f(x) = \sin(6x) + \cos(6x)$ on the interval $\left[0, \frac{\pi}{18}\right]$.

- a) $f\left(\frac{\pi}{6}\right) = -1$
- b) $f\left(\frac{\pi}{2}\right) = -1$
- c) $f\left(\frac{\pi}{4}\right) = -1$
- d) $f\left(\frac{\pi}{24}\right) = \sqrt{2}$
- e) $f(0) = 1$

15. (5 pts.) Evaluate $\int_0^1 x^{\frac{3}{7}} dx$.

- a) $\frac{7}{10}$
- b) $\frac{10}{7}$
- c) $\frac{10}{3}$
- d) $\frac{3}{10}$
- e) $\frac{3}{7}$

12. (5 pts.) Find the intervals of increase and decrease of the function $f(x) = x^3 - 9x^2 + 15x$.

- a) f increasing on $(-\infty, 1)$ and $(5, \infty)$, and decreasing on $(1, 5)$
- b) f decreasing on $(-\infty, 3)$ and $(15, \infty)$, and increasing on $(3, 15)$
- c) f increasing on $(-\infty, 3)$ and $(15, \infty)$, and decreasing on $(3, 15)$
- d) f decreasing on $(-\infty, 1)$ and $(5, \infty)$, and increasing on $(1, 5)$
- e) f increasing on $(-\infty, \infty)$

16. (5 pts.) Evaluate $\int x(8 + 8x^4) dx$.

- a) $4x^2 + \frac{8}{5}x^5 + C$
- b) $4x^2 + 8x^6 + C$
- c) $8x + \frac{4}{3}x^6 + C$
- d) $4x^2 + \frac{4}{3}x^6 + C$
- e) $x^2(8x + \frac{8}{5}x^5) + C$

17. (5 pts.) Evaluate $\int t^2 \cos(4 - t^3) dt$.

- a) $\frac{1}{3} \sin(4 - t^3) + C$
- b) $\frac{1}{3} \cos(4 - t^3) + C$
- c) $-\frac{1}{2} \sin(4 - t^3) + C$
- d) $-\sin(4 - t^3) + C$
- e) $-\frac{1}{3} \sin(4 - t^3) + C$

21. (12 pts.) One car travels due north from Duluth at 40 mph and another car, starting at the same time and from the same place, travels due west at 30 mph. How fast is the distance between them increasing after one hour?

18. (5 pts.) Set up an integral to calculate the area of the region bounded by $y = x + 3$ and $y = 23 - x^2$.

- a) $\int_{-4}^5 [(23 - x^2) - (x + 3)] dx$
- b) $\int_3^{23} [(23 - x^2) - (x + 3)] dx$
- c) $\int_{-5}^4 [(x + 3) - (23 - x^2)] dx$
- d) $\int_{-5}^4 [(23 - x^2) - (x + 3)] dx$
- e) $\int_3^{23} [(x + 3) - (23 - x^2)] dx$

19. (5 pts.) Find the volume of the solid obtained by rotating the region in the first quadrant bounded by $y = x^2$ and $y = 3$ about the y -axis.

- a) $\frac{9}{2}$
- b) $\frac{9}{2}\pi$
- c) $\frac{3}{2}\pi$
- d) 3π
- e) 9π

20. (5 pts.) Find the volume generated by rotating the region bounded by $y = \frac{1}{x}$, $y = 0$, $x = 1$ and $x = 3$ about the y -axis.

- a) 2π
- b) π
- c) 5π
- d) 4π
- e) 3π

22. (12 pts.) The sum of two positive numbers is 48. What is the smallest possible value of the sum of their squares?
23. (12 pts.) Find the absolute maximum and absolute minimum values of the function $f(x) = 2x^3 - 3x^2 - 12x + 15$ on the interval $[0, 3]$.

24. (14 pts.) A region R in the xy - plane is bounded by $x = y^2$ and $y = x^2$.

a) (4 pts.) Sketch the region R . Be sure to label the curves and intersection points.

b) (5 pts.) Set up the integral (by using the **Washer Method**) which measures the volume of the solid generated by revolving R around the x -axis. DO NOT evaluate the integral.

c) (5pts.) Set up the integral (by using the **Cylindrical Shell Method**) Which measures the volume of the solid generated by revolving R around the x -axis. DO NOT evaluatc the integral.

ITEM NO.	FORM:	A
1		D
2		C
3		C
4		B
5		C
6		E
7		C
8		E
9		C
10		C
11		D
12		A
13		E
14		A
15		A
16		D
17		E
18		D
19		B
20		D

21. 50 mph
 22. 1152 (must show a minimum)
 23. Absolute min: -5
 Absolute max: 15
 24. a) graph... must have intersection points (0,0) (1,1) labeled

$$b) V = \pi \int_0^1 \left[(\sqrt{x})^2 - (x^2)^2 \right] dx = \pi \int_0^1 (x - x^4) dx$$

$$c) V = 2\pi \int_0^1 y(\sqrt{y} - y^2) dy$$