1. Evaluate $\lim_{x\to 0} \dfrac{x-1}{x^2(x+7)}$.

   a) $\dfrac{1}{7}$

   b) $-\infty$

   c) ∞

   d) $-\dfrac{1}{7}$

   e) 0

2. Evaluate $\lim_{x\to 0} x^6 \cos\left(\dfrac{2}{x}\right)$.

   a) 1

   b) 2

   c) 6

   d) 0

   e) The limit does not exist.

3. If $f(x)$ and $g(x)$ are continuous functions with $f(5) = 2$ and $\lim_{x\to 5}[6f(x) - g(x)] = 3$, find $g(5)$.

   a) 2

   b) 15

   c) 9

   d) 6

   e) 5

4. Find a such that the function $f(s) = 2s + \sqrt{a - s^2}$ has the domain $[-3, 3]$.

   a) $a = 9$

   b) $a = 3$

   c) $a = \sqrt{3}$

   d) $a = -9$

   e) $a = -3$

5. If the tangent line to $y = f(x)$ at $(1, 4)$ passes through the point $(3, 18)$, find $f'(1)$.

   a) $f'(1) = 14$

   b) $f'(1) = -7$

   c) $f'(1) = 8$

   d) $f'(1) - 7$

   e) $f'(1) = -14$

6. The limit below represents the derivative of a function $f(x)$ at some number a. State $f(x)$ and a.

$$\lim_{t\to 0} \frac{\sin(\frac{\pi}{2} + t) - 1}{t}$$

   a) $f(x) = \sin(x), a = \dfrac{\pi}{2}$

   b) $f(x) = \sin\left(x + \dfrac{\pi}{2}\right), a = \dfrac{\pi}{2}$

   c) $f(x) = \sin(x), a = 0$

   d) $f(x) = \cos(x), a = \dfrac{\pi}{2}$

   e) $f(x) = \sin(x), a = 1$

7. Find the domain of the derivative of the function $g(x) = \sqrt{24 + 8x}$.

   a) $(-\infty, \infty)$

   b) $(-3, \infty)$

   c) $(-\infty, -3)$

   d) $(-\infty, -3]$

   e) $[-3, \infty)$

8. If $f(-2) = 5, f'(-2) = -5, g(-2) = -2$ and $g'(-2) = 5$, find $(fg)'(-2)$.

   a) 35

   b) 36

   c) 44

   d) 40

   e) 42

9. If a ball is thrown vertically upward with a velocity of 140 ft/s, then its height after t seconds is $h = 140t - 7t^2$. What is the maximum height reached by the ball?

   a) 10 ft

   b) 700 ft

   c) 100 ft

   d) 20 ft

   e) 980 ft

10. Differentiate $y = \dfrac{\tan x - 6}{\sec x}$.

a) $\dfrac{dy}{dx} = \cos x - \sin x$

b) $\dfrac{dy}{dx} = 6\cos x + \sin x$

c) $\dfrac{dy}{dx} = \cos x + 6\sin x$

d) $\dfrac{dy}{dx} = 6\cos x - \sin x$

e) $\dfrac{dy}{dx} = \cos x + \sin x$

11. Find an equation of the tangent line to the curve $y = 8\tan x$ at the point $(\frac{\pi}{4}, 8)$.

a) $y = 17x + 16 - 8\pi$

b) $y = 26x + 1 - \dfrac{\pi}{2}$

c) $y = 16x + 8 - 4\pi$

d) $y = 25x + 17 - \dfrac{17\pi}{2}$

e) $y = 7x + 10 - 5\pi$

12. Evaluate $\lim\limits_{\theta \to 0} \dfrac{\sin(\cos\theta)}{\sec\theta}$.

a) 1

b) $\cos 1$

c) 0

d) $\sin 1$

e) ∞

13. If $f(x) = 5\sin(\sin(x))$, find $f'(\pi)$.

a) 1

b) -5

c) 5

d) 0

e) -1

14. Use implicit differentiation to find $\dfrac{dy}{dx}$ at $(1, 1)$ where $x^3 + x^2y + 4y^2 = 6$.

a) $\dfrac{5}{9}$

b) $\dfrac{2}{3}$

c) $-\dfrac{9}{5}$

d) $-\dfrac{5}{9}$

e) $-\dfrac{3}{2}$

15. Find the second derivative of the function $y = \dfrac{x}{9 - x}$.

a) $y'' = -\dfrac{9}{(9-x)^3}$

b) $y'' = \dfrac{9}{(9-x)^2}$

c) $y'' = -\dfrac{1}{(9-x)^2}$

d) $y'' = -\dfrac{18}{(9-x)^3}$

e) $y'' = \dfrac{18}{(9-x)^3}$

16. (4 pts.) a) State the limit definition of $f'(a)$, the derivative of the function $f(x)$ at the point a.

(6 pts.) b) Use the above definition to find the derivative $f'(-2)$ for $f(x) = 5 - 2x + 3x^2$. (No credit will be given for the use of any methods other than the limit definition of derivatives.)

17. (8 pts.) Use implicit differentiation to find an equation of the tangent line to the curve $x^2 + 2xy - y^2 + x = 2$ at the point $(1, 2)$.

18. (7 pts.) If $f(x) = 2\sqrt{x} + \dfrac{1}{2\sqrt{x}}$, find $f''(9)$.

SP 07

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

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16. a. $f'(a)=\lim_{h\to 0}\frac{f(a+h)-f(a)}{h}$ or $f'(a)=\lim_{x\to a}\frac{f(x)-f(a)}{x-a}$

b. Answer: -14, but must follow through correctly using one of above forms

17. $y=\frac{7}{2}x-\frac{3}{2}$

18. $-\frac{11}{8\cdot 3^4}$