1. Find $\lim_{x \to 0^-} \frac{1}{1+e^{\frac{1}{x}}}$.

a) 0

b) ∞

c) $-\infty$

d) 1

e) $\frac{1}{2}$

2. Choose an expression for the slope of the secant line of the curve $y = \sqrt{x}$ through the points $P(8, \sqrt{8})$ and $Q(x, \sqrt{x})$.

a) $\sqrt{x} - \sqrt{8}$

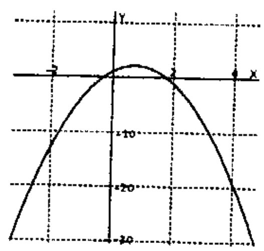
b) $\sqrt{8} - \sqrt{x}$

c) $\frac{1}{\sqrt{8}+\sqrt{x}}$

d) $\frac{1}{x+8}$

e) $\frac{1}{\sqrt{x}-\sqrt{8}}$

3. Select the true statement for the graph of a function $f(x)$ given below.



a) $f'(0) = 3, f'(1) = 1, f'(2) = -5$

b) $f'(0) = -3, f'(1) = -1, f'(2) = -5$

c) $f'(0) = 3, f'(1) = -1, f'(2) = 5$

d) $f'(0) = 3, f'(1) = 1, f'(2) = 5$

e) $f'(0) = 3, f'(1) = -1, f'(2) = -5$

4. Find $\lim_{x \to 2^-} \frac{x^2-4}{|x-2|}$.

a) 2

b) -2

c) -4

d) 4

e) ∞

5. Find the second derivative of the function $G(r) = \sqrt{r} + \sqrt[3]{r}$.

a) $\frac{1}{2}r^{-\frac{1}{2}} + \frac{1}{3}r^{-\frac{2}{3}}$

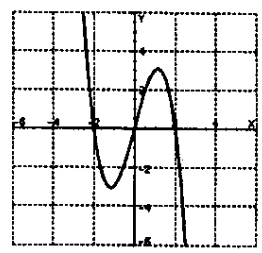
b) $-\frac{1}{4}r^{-\frac{3}{2}} - \frac{2}{9}r^{-\frac{5}{3}}$

c) $\frac{1}{4}r^{-\frac{3}{2}} - \frac{2}{9}r^{-\frac{5}{3}}$

d) $-\frac{1}{4}r^{-\frac{3}{2}} + \frac{2}{9}r^{-\frac{5}{3}}$

e) $-\frac{1}{2}r^{\frac{1}{2}} + \frac{1}{3}r^{\frac{2}{3}}$

6. Using the graph of $f(x)$ below, estimate the value of the derivative at the point $x = 0$.



a) 4

b) 0

c) -4

d) ∞

e) $-\infty$

7. Consider the following function $f(x) = \begin{cases} 3-x & x < -1 \\ x+5 & -1 \le x < 2 \\ (x-2)^2 & x \ge 2 \end{cases}$ and determine the values of a for which $\lim_{x \to a} f(x)$ exists.

a) $(-\infty, -1) \cup (-1, 2) \cup (2, \infty)$

b) $(-\infty, \infty)$

c) $(-\infty, 2) \cup (2, \infty)$

d) $(-\infty, -1) \cup (-1, \infty)$

e) $(-\infty, -1) \cup (2, \infty)$

8. The position function of a particle is given by $s = t^3 - 9t^2 - 6t$, $t \geq 0$. When does the particle reach a velocity of 15 m/s?

a) $t = 1$ sec

b) $t = 2$ sec

c) $t = 5$ sec

d) $t = 7$ sec

e) $t = 9$ sec

9. If $h(-4) = -3$ and $h'(-4) = -3$, find $\frac{d}{dx}\left(\frac{h(x)}{x}\right)$ at $x = -4$.

a) $\frac{5}{11}$

b) 1

c) $\frac{25}{26}$

d) $\frac{15}{16}$

e) $\frac{6}{7}$

10. Evaluate $\lim_{x \to 0} \frac{(5+x)^{-1} - 5^{-1}}{x}$.

a) $\frac{1}{25}$

b) $\frac{1}{5}$

c) $-\frac{1}{25}$

d) The limit does not exist.

e) 0

11. Find an equation of the tangent line to the curve $y = x^7 \cos x$ at the point $(\pi, -\pi^7)$.

a) $y = -7\pi^6 x + 2\pi^7$

b) $y = -\pi^6 x + 3\pi^7$

c) $y = -13\pi^6 x + 14\pi^7$

d) $y = \pi^6 x + \pi^7$

e) $y = -7\pi^6 x + 6\pi^7$

12. Find y' by implicit differentiation where $20\cos(x)\sin(y) = 2$.

a) $y' = \tan(x)$

b) $y' = -20\sin(x)\cos(y)$

c) $y' = \tan(x)\tan(y)$

d) $y' = \cot(x)\cot(y)$

e) $y' = \tan(xy)$

13. Evaluate $\lim_{x \to 11\pi} \sin(x + 6\sin x)$.

a) 1

b) -1

c) 0

d) 11π

e) ∞

14. If $f(x) = \frac{\sqrt{2 - x^2}}{x}$, find $f'(1)$.

a) -1

b) 1

c) 0

d) -2

e) 2

15. Find $\lim_{x \to \frac{\pi}{4}} \frac{\cos x - \sin x}{\cos 2x}$.

a) $-\frac{\sqrt{2}}{2}$

b) $\frac{\sqrt{2}}{2}$

c) ∞

d) $-\infty$

e) 0

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

b)(6 pts.) Use the above definition to find the derivative $f'(5)$ for $f(x) = \dfrac{1}{x+4}$. (No credit will be given for the use of any methods other than the limit definition of derivatives.)

17. (8 pts.) Find $\dfrac{dy}{dx}$ at the point $(2, 4)$ where $(x^2 + y^2)^2 = 50xy$.

18. (7 pts.) If $f(x) = \dfrac{\sin x}{x}$, find $f''(x)$.

FALL 06 MATH 140 EXAM 1

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

16. a) See box 2 or box 3 on page 127 of your text

b) Using either of the above definitions:

$$f'(5) = -\frac{1}{81}$$

17. Use implicit differentiation:

$$2(x^2 + y^2)[2x + 2yy'] = 50[y + xy']$$

Plug in x = 2 and y = 4 and solve for

$$y' = \frac{2}{11}$$

18.

$$f'(x) = \frac{x\cos(x) - \sin(x)}{x^2}$$

$$f''(x) = \frac{-x^2\sin(x) - 2x\cos(x) + 2\sin(x)}{x^3}$$