

Calculation Review

1. Use a tech tool to graph each function below. *Estimate the instantaneous rate of change at the indicated point.*

(a) $y=x^2, x=2$

(e) $y=x^2e^x, x=1$

(b) $y=x^2, x=0$

(f) $y=7, x=2$

(c) $y=3x^2, x=2$

(g) $f(x)=\frac{1}{x+3}, x=0$

(d) $y=x^4-3x^2+4, x=-1$

(h) $f(x)=2\sin x, x=\pi$

2. Estimate the *slope of the tangent line* for each function in #1 at the indicated point.
3. Find the *average rate of change* for each function in #1 between $x=-4$ and the indicated point.
4. Find the *equation of the tangent line* for each function in #1 at the indicated point. The derivative is provided below so you don't need to compute it with the limit definition.

(a) $f(x)=x^2, f'(x)=2x, x=2$

(e) $y=x^2e^x, y'=xe^x(x+2), x=1$

(b) $y=x^2, y'=2x, x=0$

(f) $y=7, y'=0, x=2$

(c) $y=3x^2, y'=6x, x=2$

(g) $f(x)=\frac{1}{x+3}, f'(x)=\frac{-1}{(x+3)^2}, x=0$

(d) $y=x^4-3x^2, y'=4x^3-6x, x=-1$

(h) $y=2\sin x, y'=2\cos x, x=\pi$

5. Use the *limit definition* to compute the derivative for each function at the indicated point.

(a) $f(x)=2x-5, x=2$

(h) $f(x)=-\sqrt{x}, x=1.3$

(b) $f(x)=-x+10, x=0$

(i) $f(x)=\frac{1}{2x}, x=-1/2$

(c) $f(x)=x^2+3, x=5$

(j) $f(x)=\frac{2}{1-x}, x=8$

(d) $f(x)=(x+3)^2, x=-2$

(k) $f(x)=7\sqrt{x+1}, x=0$

(e) $f(x)=(2x-1)^2, x=1/2$

(l) $f(x)=\frac{x}{x+1}, x=0$

(f) $f(x)=\frac{1}{x+3}, x=-1$

(m) $f(x)=\frac{x}{x+2}, x=3$

(g) $f(x)=\sqrt{x}, x=9$

(n) $f(x)=x^3, x=-1$

Calculation Review

6. Use the *limit definition* to compute the derivative for each function in general terms of x .

(a) $f(x) = \frac{1}{3}x + 4$

(b) $f(x) = -2x - 2$

(c) $f(x) = mx + b$ (m and b are constants)

(d) $f(x) = x^2 - x + 1.5$

(e) $f(x) = 2x^2 + x - 1$

(f) $f(x) = 3x^2 + 1$

(g) $f(x) = (3x - 1)^2$

(h) $f(x) = (x + 0.5)^2$

(i) $f(x) = -x^2 + \pi$

(j) $f(x) = 5 + \sqrt{x}$

(k) $f(x) = \sqrt{5 + x}$

(l) $f(x) = \sqrt{x + 1}$

(m) $f(x) = \sqrt{3x + 4}$

(n) $f(x) = \sqrt{1 - 4x}$

(o) $f(x) = -\frac{1}{x}$

(p) $f(x) = (4x)^{-1}$

(q) $f(x) = \frac{1}{x-2}$

(r) $f(x) = -\frac{2}{2-x}$

(s) $f(x) = \sqrt{1/x}$

(t) $f(x) = (1-x)^3$

7. Given the derivative and a particular point, determine if the original function is increasing, decreasing, or neither at the point.

(a) $f'(x) = 2, x = 5$

(b) $f'(x) = -x, x = 1$

(c) $f'(x) = 3x^2, x = 0$

(d) $f'(x) = -(x+3)^2, x = -5$

(e) $f'(x) = (2x-1)^2, x = 1$

(f) $f'(x) = \frac{1}{x+3}, x = -7$

(g) $f'(x) = \sqrt{x+4}, x = 1$

(h) $f'(x) = \frac{1}{2x}, x = 1/2$

(i) $f'(x) = 7\sqrt{x+1}, x = 0$

(j) $f'(x) = \frac{x}{x+1}, x = -1/2$

8. (1) Use the derivative to determine the x -values at which the original function has a horizontal tangent line. (2) Is the function non-differentiable at any of the given points?

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

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

(c) $f'(x) = 3x^2, x = 0, 1/3, 1/2$

(d) $f'(x) = -(x+3)^2, x = -5, -3, -1$

(e) $f'(x) = x^3 - x^2 - x + 1, x = -1, 0, 1$

(f) $f'(x) = \frac{1}{x+3}, x = -3, -2, -1$

(g) $f'(x) = \sqrt{x+4}, x = -5, 5, 9$

(h) $f'(x) = \frac{1}{2x}, x = -1/2, 0, 1/2$

(i) $f'(x) = 7\sqrt{x+1}, x = -2, -1, 0$

(j) $f'(x) = \frac{x}{x+1}, x = -1, 0, 1$

Answers

CONCEPT

- | | | | |
|------|-------------------------------|---------------|--------------------------|
| 1. F | 6. T | 11. $y=mx+b$ | 16. $y=-(x-3.5)^2$ |
| 2. T | 7. T | 12. $y=e^x$ | 17. if $y=x^2$, $a=1$, |
| 3. T | 8. F | 13. $y=x^2+k$ | $b=3$, then $c=2$ |
| 4. F | 9. T | 14. $y=x+b$ | 18. discontinuous, |
| 5. F | 10. $y=mx+b$,
$y=(x-2)^3$ | 15. $y=x$ | nondifferentia
ble |

CALCULATION

1. (a) 4 (c) 12 (e) 8.1548 (g) $-1/9$
(b) 0 (d) 2 (f) 0 (h) -2
2. Same answers as in #1.
3. (a) -2 (c) -6 (e) 0.485 (g) $1/3$
(b) -4 (d) -70.666 (f) 0 (h) -0.2119
4. (a) $y=4x-4$ (e) $y=8.1548x-5.4366$
(b) $y=0$ (f) $y=7$
(c) $y=12x-12$ (g) $y=-\frac{1}{9}x+\frac{1}{3}$
(d) $y=2x$ (h) $y=2x-2\pi$
5. (a) 2 (e) 0 (i) 2 (m) 0.08
(b) -1 (f) $-1/4$ (j) 8 (n) 3
(c) 10 (g) $1/6$ (k) -7
(d) 2 (h) -0.4385 (l) 1
6. (a) $f'(x)=\frac{1}{3}$ (h) $f'(x)=2x+1$ (o) $f'(x)=-\frac{1}{x^2}$
(b) $f'(x)=-2$ (i) $f'(x)=-2x$ (p) $f'(x)=-\frac{1}{4}x^{-2}$
(c) $f'(x)=m$ (j) $f'(x)=\frac{1}{2\sqrt{x}}$ (q) $f'(x)=-\frac{1}{(x-2)^2}$
(d) $f'(x)=2x-1$ (k) $f'(x)=\frac{1}{2\sqrt{x+5}}$ (r) $f'(x)=\frac{2}{(2-x)^2}$
(e) $f'(x)=4x$ (l) $f'(x)=\frac{1}{2\sqrt{x+1}}$ (s) $f'(x)=-\frac{1}{2}x^{-3/2}$
(f) $f'(x)=6x$ (m) $f'(x)=\frac{3}{2\sqrt{3x+4}}$ (t) $f'(x)=-3(x-1)^2$
(g) $f'(x)=18x-6$ (n) $f'(x)=\frac{-2}{\sqrt{1-4x}}$
7. (a) increasing (d) decreasing (g) increasing (j) decreasing
(b) decreasing (e) increasing (h) increasing
(c) neither (f) decreasing (i) increasing
8. (a) (1) none, (2) no (e) (1) $x=-1, 1$, (2) no (i) (1) none, (2) $x=-2$
(b) (1) $x=0$, (2) no (f) (1) none, (2) $x=-3$ (j) (1) $x=0$, (2) $x=-1$
(c) (1) $x=0$, (2) no (g) (1) none, (2) $x=-5$
(d) (1) $x=-3$, (2) no (h) (1) none, (2) $x=0$