

Answers to Additional Problems

Unit Four

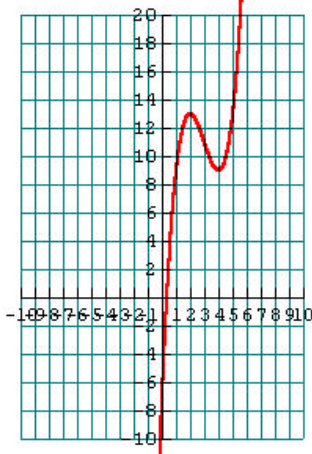
1. $y' = 3x^2 - 18x + 24 = 3(x - 4)(x - 2)$

$y'' = 6x - 18 = 6(x - 3)$

a) $x < 2$, $x > 4$ b) $2 < x < 4$

c) Relative Maximum (2,13) Relative Minimum ((4,9)

d) $x > 3$ e) $x < 3$ f) (3,11)



2. $y' = \frac{6(3 - x^2)}{(x^2 + 3)^2}$

$y'' = \frac{12x(x - 3)(x + 3)}{(x^2 + 3)^3}$

a) $-\sqrt{3} < x < \sqrt{3}$

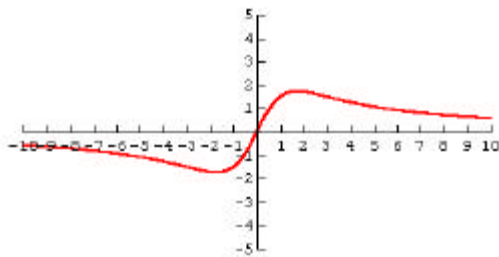
b) $x < -\sqrt{3}$, $x > \sqrt{3}$

c) Relative Maximum Point $(\sqrt{3}, \sqrt{3})$

Relative Minimum Point $(-\sqrt{3}, -\sqrt{3})$

d) $-3 < x < 0$, $x > 3$ e) $x < -3$, $0 < x < 3$

f) $(-3, -1.5)$, $(0, 0)$, $(3, 1.5)$



3. $y' = 5x^4$ $y'' = 20x^3$

a) All Real, $x \neq 0$

b) None

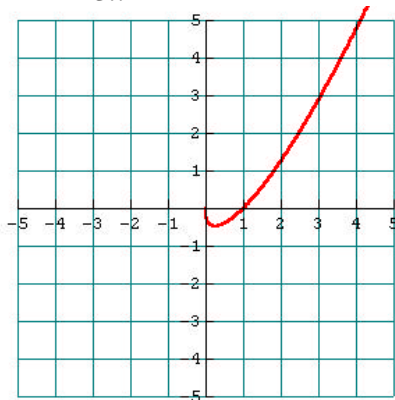
c) None

d) $x > 0$

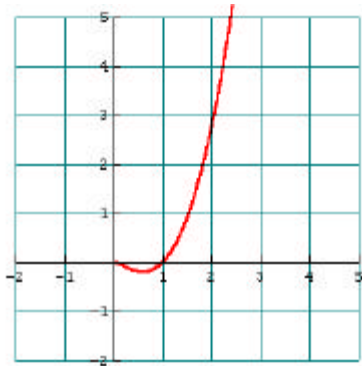
e) $x < 0$

f) (0,0)

4. $y' = \frac{4x-1}{3x^{\frac{2}{3}}}$ $x > \frac{1}{4}$



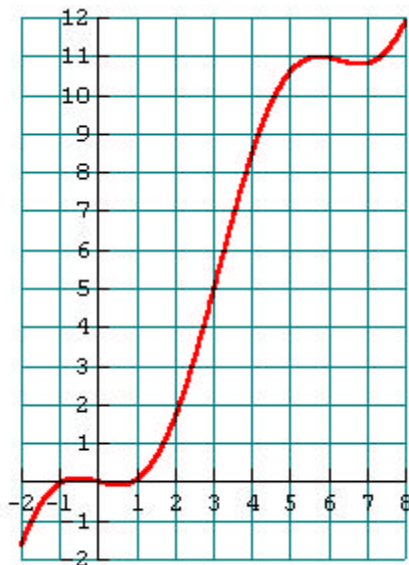
5. $y' = x(1 + 2 \ln x)$ $x = e^{-\frac{1}{2}}$



6. $y' = \sqrt{3} - 2 \cos x$ $y'' = 2 \sin x$

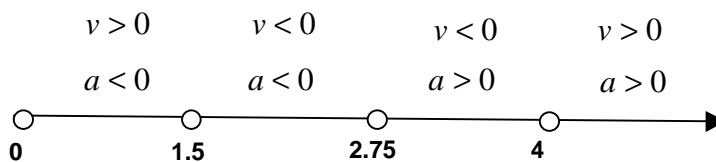
Relative Maximum $x = \frac{11\pi}{6}$

Relative Minimum $x = \frac{\pi}{6}$



7. Absolute Maximum Value is 54.
Absolute Minimum Value is -54.
8. Point A $v > 0$ and $a < 0$ Particle slowing down.
Point B $v < 0$ and $a < 0$ Particle speeding up
Point C $v < 0$ and $a > 0$ Particle slowing down
Point D $v > 0$ and $a > 0$ Particle speeding up

9. a) $v(t) = 12t^2 - 66t + 72$
b) $a(t) = 24t - 66$
c) When is $v(t) = 0$? $t = 1.5$ or $t = 4$



- d) $0 < t < 1\frac{1}{2}$ or $2\frac{3}{4} < t < 4$
e) $1\frac{1}{2} < t < 2\frac{3}{4}$ or $t > 4$
10. a) $s(t) = 96t - 16t^2$ b) $v(t) = 96 - 32t$
c) $t = 3$ sec. d) 144 feet
e) $v(6) = -96$ ft.sec Since speed = $|v(t)|$, then speed is 96 ft.sec.

11. $s(t) = s_0 - 4.9t^2$ $s(0) = s_0$ $s(2) = s_0 - 19.6$
In two seconds the item will fall $s(0) - s(2)$ or 19.6 meters

12. $A = xy$ Using similar triangles, $\frac{12}{16} = \frac{y}{16-x}$ or $y = 12 - \frac{3}{4}x$

Using $A = x(12 - \frac{3}{4}x)$, the dimensions are 8 inches by 6 inches.

13. Using $V = x^2y$ and $72 = 1(x^2) + 5(x^2) + 4(xy)$, then $x = 2$ and $y = 6$.

14. Using $V = (15 - 2x)(8 - 2x)(x)$, then $x = \frac{5}{3}$.

Note: $x = 6$ must be excluded since $8 - 2x < 0$.

15. $r = h$ $r = \frac{10}{\sqrt[3]{p}}$ $h = \frac{10}{\sqrt[3]{p}}$

16. $x_{n+1} = \frac{2x_n^3 + 1}{3x_n^2 - 4}$ 2.114907541

17. If $f(x) = x^3 - 0.5x - 6$, then $x_{n+1} = \frac{2x_n^3 + 6}{3x_n^2 - 0.5}$ 1.908766819