Honors Precalculus. Review of Calculus Preview Topics. Name__

1. Use the definition of derivative to find $f'(x)$

or $f(x)=x^3+5x^2$ $\quad f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$

2. Use the right endpoint method to find the area under the curve for $f(x)=3x^2-8x+2$ on [1,5]

Formulas you will need:

For $[a,b]$ $\Delta=\frac{b-a}{n}$ $\quad x_k=a+k\Delta$ right endpoint

Area $=\lim_{n\to\infty}\sum_{k=1}^{n}\Delta f(x_k)$

3. A particle moves along a line, such that its position, velocity, and acceleration functions are below. The particle moves from [0,8] seconds. Distances measured in meters:

$s(t)=t^3-9t^2+4$

$v(t)=3t^2-18t$

$a(t)=6t-18$

Find: (a) The position at t = 0 and t = 8

(b) When is the particle stopped, traveling to the right, and traveling to the left.

(c) Where is the particle when it is stopped.

(d) Sketch a schematic picture of the motion in the first 8 seconds.

(e) Find the displacement in the first 8 seconds.

(f) Find the total distance in the first 8 seconds.

(g) When is the particle speeding up and slowing down.?

) What is the average velocity of the particle?

4. Evaluate (Approximate) $\int_0^8 (x^3-5x^2)\,dx$ using $n=4$ and a left-endpoint method.

5. Approximate the Area under the curve of $f(x)$ on [1, 10] using $n=3$ and a right-endpoint method.

X	1	2	3	4	5	6	7	8	9	10
f(x)	0	3	10	21	36	55	78	105	136	171

6. Find the Area formula for the cross-sections taken perpendicular to the x-axis of the Solid created when $y=\sqrt{x+4}$, $x=5$, $y=0$ is rotated about the x-axis.

7. Use the same region $y=\sqrt{x+4}$, $x=5$, $y=0$. The solid is formed by equilateral triangles taken perpendicular to the x-axis. Find the formula for area of a cross-section

8. A Solid is formed when semicircles with diameters perpendicular to the x-axis are stacked across the region $y=\sqrt{x}$, $x=0$, $y=2x-5$. Find formula for area of the cross-sections.

9. A solid is formed when squares with sides perpendicular to the y-axis, are stacked across the region $x=-y^2+4$, $x=-y+2$. Find the formula for the area of the cross-sections perpendicular to the y-axis.

10. A solid is formed when the region $x=-y^2+4$, $x=-y+2$ is rotated about the y-axis. Find a formula for the area of the cross-sections taken perpendicular to the y-axis.

#1. $f(x) = x^3 + 5x^2$

$$f'(x) = \lim_{h\to 0} \frac{(x+h)^3 + 5(x+h)^2 - x^3 - 5x^2}{h}$$

$$= \lim_{h\to 0} \frac{\cancel{x^3} + 3x^2h + 3xh^2 + \cancel{5x^2} + 10xh + 5h^2 - \cancel{x^3} - \cancel{5x^2}}{h}$$

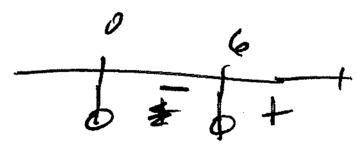
$$= \lim_{h\to 0} \frac{h(3x^2 + 3xh + 10x + 5h)}{h} = \lim_{h\to 0}(3x^2 + 3xh + 10x + 5h)$$

$$\boxed{f'(x) = 3x^2 + 10x}$$

3. $s(t) = t^3 - 9t^2 + 4 =$

$v(t) = 3t^2 - 18t = 3t(t-6)$

$a(t) = 6t - 18 = 6(t-3)$



a) $s(0) = 4$m. $s(8) = -60$m.

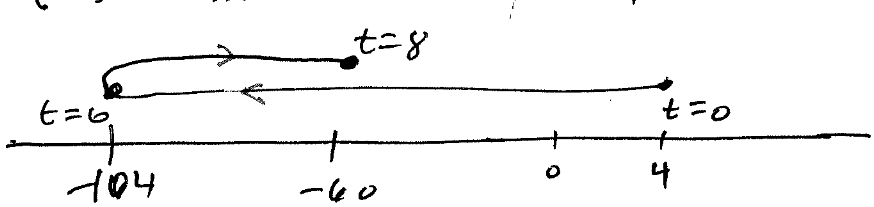
b) stopped at 0 sec and 6 sec

right: $(6, 8)$ seconds

left. $(0, 6)$ seconds

c) $s(0) = 4$m $s(6) = -104$m

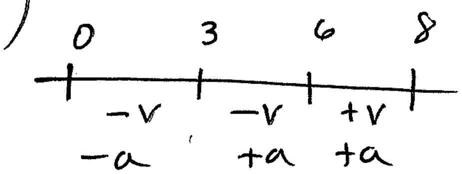
d)



e) -64m

f) 152m

g)



speeding up $(0,3)(6,8)$ seconds

slowing down $(3,6)$ sec.

h) $\frac{s(8) - s(0)}{8} = \frac{-60-4}{8}$

$\boxed{-8 \text{ m/sec}}$

#2. $f(x) = 3x^2 - 8x + 2$ on $[1, 5]$

$$\Delta x = \frac{5-1}{n} = \frac{4}{n} \qquad a=1 \quad b=5$$

$$\lim_{n\to\infty} \sum_{K=1}^{n} \tfrac{4}{n} f\left(1 + K\cdot\tfrac{4}{n}\right)$$

$$\lim_{n\to\infty} \sum_{K=1}^{n} \frac{4}{n}\left(3\left(1+\tfrac{4}{n}K\right)^2 - 8\left(1+\tfrac{4}{n}K\right)+2\right)$$

$$\lim_{n\to\infty} \sum_{K=1}^{n} \frac{4}{n}\left(3\left(1+\tfrac{8}{n}K+\tfrac{16K^2}{n^2}\right) - 8 - \tfrac{32}{n}K + 2\right)$$

$$\lim_{n\to\infty} \frac{4}{n} \sum_{K=1}^{n} \left(3 + \tfrac{24}{n}K + \frac{48K^2}{n^2} - 8 - \tfrac{32}{n}K + 2\right)$$

$$\lim_{n\to\infty} \frac{4}{n} \sum_{K=1}^{n} \left(-3 - \tfrac{8}{n}K + \frac{48}{n^2}K^2\right)$$

$$\cancel{\lim_{n\to\infty}\left[\tfrac{4}{n}\sum -3 - \tfrac{8}{n}\sum \tfrac{8}{n}K +\right.}$$

$$\lim_{n\to\infty} \frac{4}{n}\left[\sum_{K=1}^{n} -3 - \frac{32}{n^2}\sum K + \frac{192}{n^3}\sum K^2\right]$$

$$\lim_{n\to\infty}\left[\frac{4}{n}(-3n) - \frac{32}{n^2}\left(\frac{n(n+1)}{2}\right) + \frac{192}{n^3}\left(\frac{n(n+1)(2n+1)}{6}\right)\right]$$

$$\lim_{n\to\infty}\left[-12 - \frac{16(n+1)}{n} + \frac{32(n+1)(2n+1)}{n^2}\right]$$

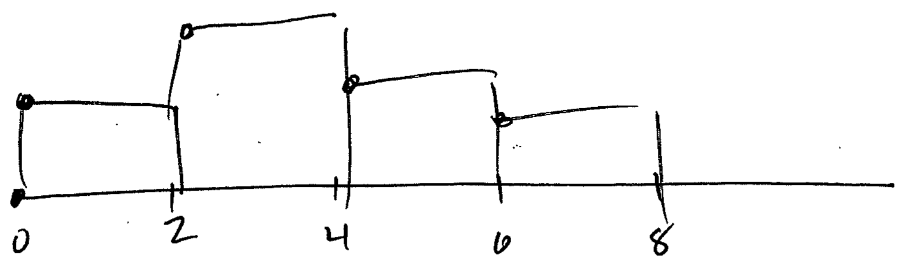
$$\lim_{n\to\infty}(-12) - \lim_{n\to\infty}\frac{16n}{n} + \lim_{n\to\infty}\frac{64n^2}{n^2}$$

$$-12 - 16 + 64 = -28+64 = \boxed{36}$$

1
96
96
192

$$\begin{array}{r} 32 \\ 6\overline{)192} \\ 18 \\ \hline 12 \end{array}$$

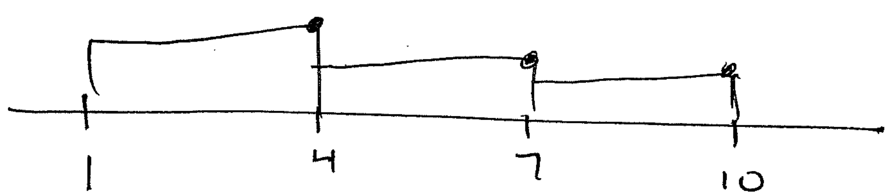
4. $\int_0^8 (x^3 - 5x^2)$ $n=4$ left-endpt. $\frac{8-0}{4} = 2$



$2\,(f(0) + f(2) + f(4) + f(6))$

$2(0 + -12 + -16 + 36) = \boxed{16}$

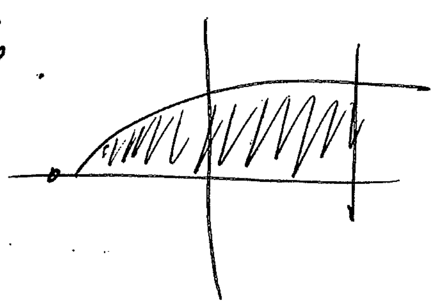
5. right endpt $\Delta x = \frac{10-1}{3} = \frac{9}{3} = 3$



$3\,(f(4) + f(7) + f(10))$

$3(21 + 78 + 171) = \boxed{810}$

6.

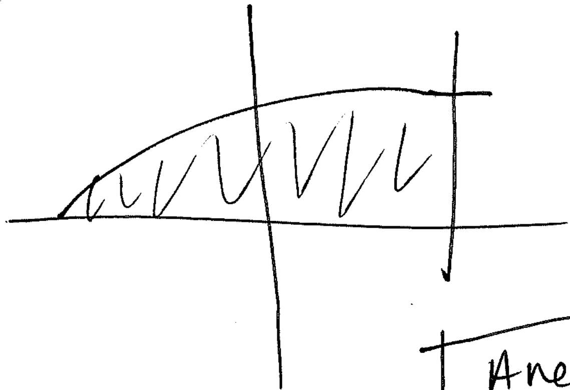


circular

$A = \pi r^2$ $r = \sqrt{x+4}$

$\boxed{\text{Area} = \pi(x+4)}$

7.

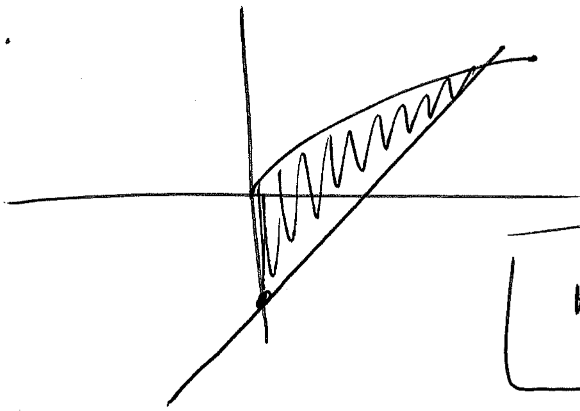


$\frac{\sqrt{3}}{4}(\text{side})^2$

$\text{side} = \sqrt{x+4}$

$$\boxed{\text{Area} = \frac{\sqrt{3}}{4}(x+4)}$$

8.



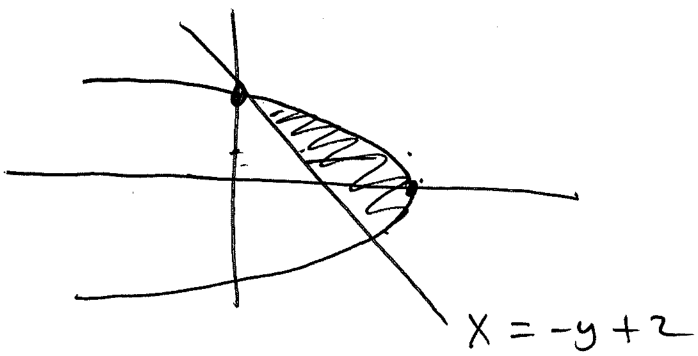
$\frac{\pi}{8} r^2$

$r = \sqrt{x} - (2x-5)$

$\sqrt{x} - 2x + 5$

$$\boxed{\text{Area} = \frac{\pi}{8}(\sqrt{x} - 2x + 5)^2}$$

9.



$x = -y + 2$

$-x = y - 2$

$-x + 2 = y$

$$\boxed{\text{Area} = (-y^2 + y + 2)^2}$$

$\text{Area} = (\text{side})^2$

$\text{side} = -y^2 + 4 - (-y + 2)$

$= -y^2 + 4 + y - 2$

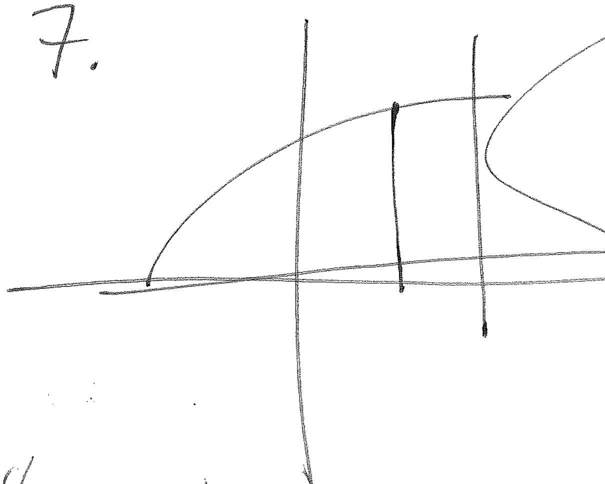
$-y^2 + y + 2$

10. Washer Same region as #9

$A = \pi(R^2 - r^2)$ $\quad R = -y^2 + 4$ $\quad r = -y + 2$

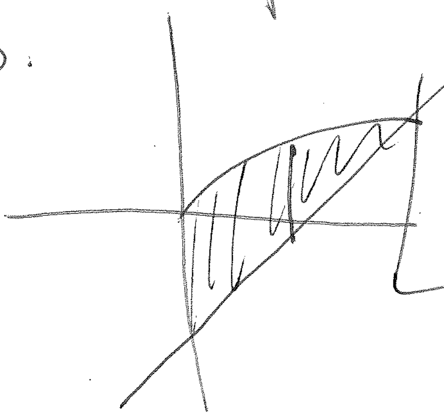
$$\boxed{\text{Area} = \pi\left((-y^2+4)^2 - (-y+2)^2\right)}$$

7.



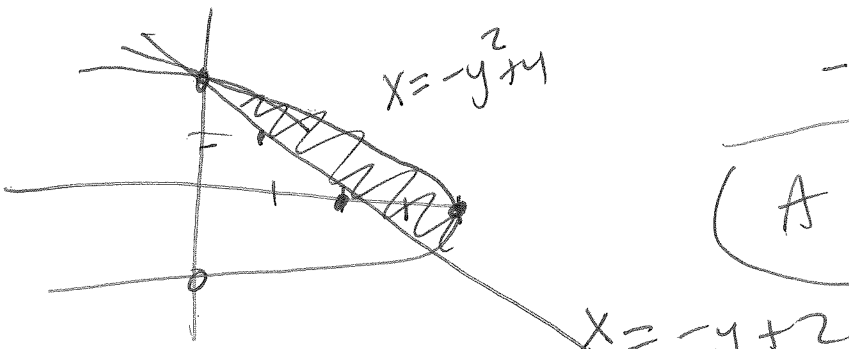
$$\text{Area} = \frac{\sqrt{3}}{4}(x+4)$$

8.



$$A = \frac{\pi}{8}\left(\sqrt{x}-2x+5\right)^2$$

9.



$$-y^2+4-(-y+2)$$

$$A = \left(-y^2+y+2\right)^2$$

10. $\pi(R^2-r^2)$

$$\pi\left((-y^2+4)^2-(-y+2)^2\right)$$