FTC Wkst.

1. $\int_{-3}^{x} f(t)\,dt$ a) $g(-3)=0$

$g(3)=0$

b) $g(-2) \approx 1$

$g(-1) \approx 3\frac{1}{2}$

$g(0) \approx 5\frac{1}{2}$

c) g increasing $(-3,0)$ $G'>0$ so $f>0$

d) $x=0$ $f(0)$ from + to neg

2. $F(x)=\int_{1}^{x} f(t)\,dt$ $f(t)=\int_{1}^{t^2} \sqrt{\frac{1+u^4}{u}}$

$F'(x)= f(t)$

$F''(x)= f'(t)$ $= f'(t)= \sqrt{\frac{1+t^8}{t^2}} \cdot 2t$

$= F''(2) = \sqrt{257}$

3. $y=\int_{0}^{x} \frac{1}{t^2+t+1}$ is concave upward.

$y' = \frac{1}{x^2+x+1}$

$y'' = -(x^2+x+1)^{-2} \cdot 2x+1$

$\frac{-(2x+1)}{(x^2+x+1)^2}$ $x = -1/2$

$\underset{-1/2}{+ \mid -}$ $(-\infty, -1/2)$

4. a relative min $x=3$, $x=7$ g' change neg to pos

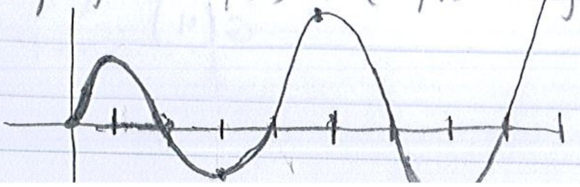
relative max $x=1$, $x=5$ g' pos to neg.

b. abs max looks like $x=5$

some might say $x=9$

c. $(1/2, 2) \cup (4,6) \cup (8,9)$ g' is decreasing.

d.



g' + | − | + | − | +

0 1 3 5 7 9

g'' + | − | + | − | + | −

$s = \int_0^t f(x)\,dx \quad s'(t) = f(x) = v(t)$

5a. 2

b. negative.

c. 4.5

d. 6.

e. $x = 4 \quad x = 7$

f. towards (6, 9)

away (0, 6)

g. right area bigger positive.

1. $F(x) = \int_1^x \cos 6t + 1$

$F'(x) = \cos(6x) + 1$

2. $F(x) = \int_0^{x^2} \frac{1}{2+t^3}\,dt \qquad F'(x) = \frac{2x}{2+x^6}$

$F'(-1) = \frac{-2}{3}$

3. $F(x) = \int_2^x \sin\left(\frac{\pi t}{4}\right) - 5$

$F(2) = -5$

$F'(2) = \sin\left(\frac{x\pi}{4}\right) = 1$

4. $G(x) = \int_0^{2x} \cos(t^2)\,dt$

$G'(x) = 2\cos(4x^2) \quad \Big| \sqrt{\pi}$

$= 2$

5. $\int_0^x \sin(t^2)\,dt$

$S'(x) = \sin(x^2)$

Avg rate $\frac{1}{2}\int_1^3 \sin(x^2)\,dx$

$\frac{1}{2}\left[\sin(9) - \sin(1)\right] \approx .232$

6. $F' = \sqrt{1+\cos^3 x} \cdot -\sin x$

$F'(\pi/2) = 1 \cdot -\sin \pi/2 = -1$

7. $15x^2 = f(t)$ by derivate.

$5x^3 + 40 = \int_0^x 15x^2 \quad 5x^3 + 40 = 5x^3 - 5a^3$

$-2 = a$

8. $F(0) = 0$

$F(3) = 1\tfrac{1}{2} \qquad \int_0^3 = 1.5$

$F(4) = 1\tfrac{1}{2} - \pi/4 \qquad \int_3^5 = -\pi/2$

$- \langle\ F(5) = 1\tfrac{1}{2} - \pi/2 \qquad \int_5^7 = 1$

$+ \langle\ F(6) = 2 - \pi/2 \qquad \int_7^8 = -1/2$

$F(7) = 2\tfrac{1}{2} - \pi/2$

$\boxed{D}$

9. a) $G(-4) = 0$

b) $G'(-1) = 2$

c) CCD $(-4,-3) \cup (-1, 2)$

g' is decreasing.

d) $x = 1$ b/c

$G(1) = \int_{-4}^1 f(t)\,dt =$ pos.

$G(4) \quad \int_{-4}^4 f(t)\,dt =$

smaller positive.