9/28 $f(x) = (x^2-10)^2 = x^4 - 20x^2 + 100$

$u = x^2 - 10 \qquad u^2$

$f'(x) = 4x^3 - 40x$

$f''(x) = 0$ where what x

$f''(x) = 12x^2 - 40$

$f'(x) = 2(x^2-10) \cdot (2x - 0)$

$2(x^2-10)(2x) = 4x(x^2-10)$

$f'(x) = 0$ at $x = 0, \pm\sqrt{10}$

$f''(x) = 4[1(x^2-10) + x(2x)]$

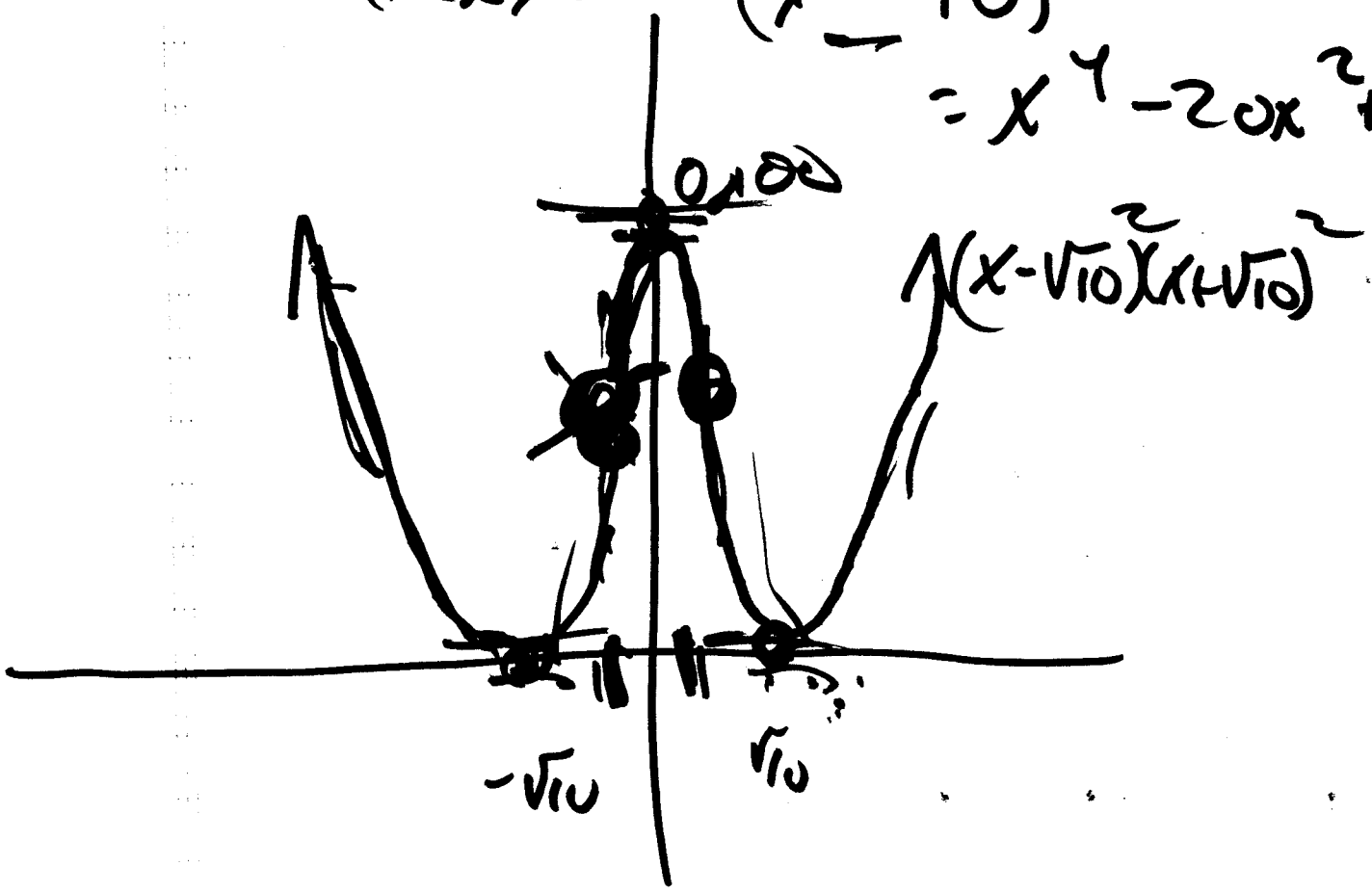
$= 4[x^2 - 10 + 2x^2]$

$= 4(3x^2 - 10)$ ✓

$f''(x) = 0$ when $x = \pm\sqrt{\frac{10}{3}}$

$f(x) = (x^2 - 10)^2$

$= x^4 - 20x^2 + 100$

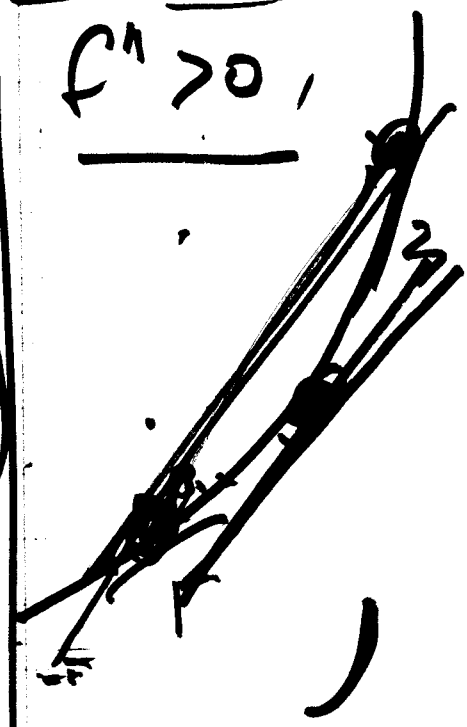


$f''(x) = 0 \quad x = \pm\sqrt{\frac{10}{3}}$

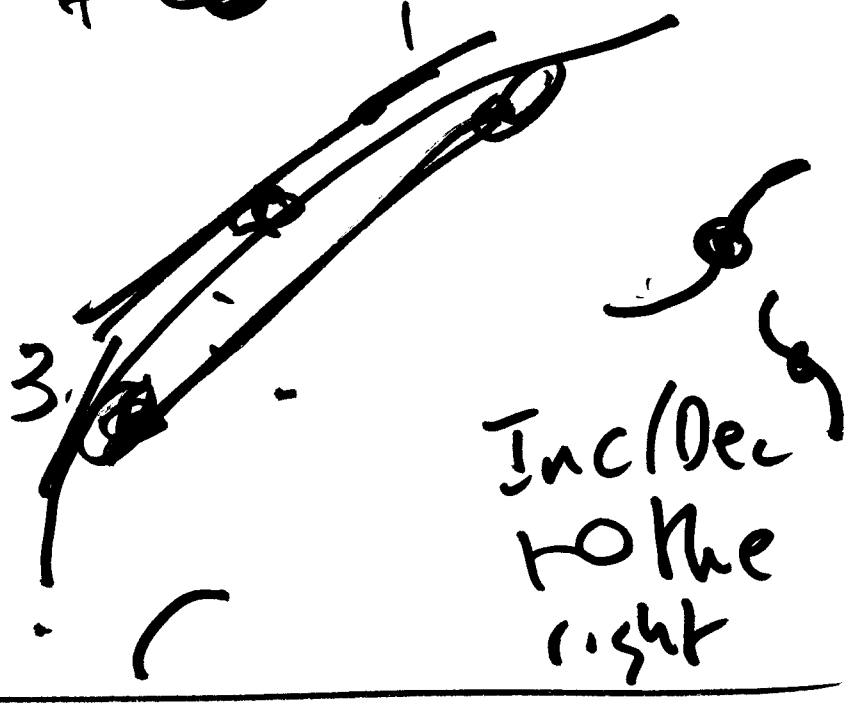
f' increasing

$f' > 0$

$f' > 0$
f inc



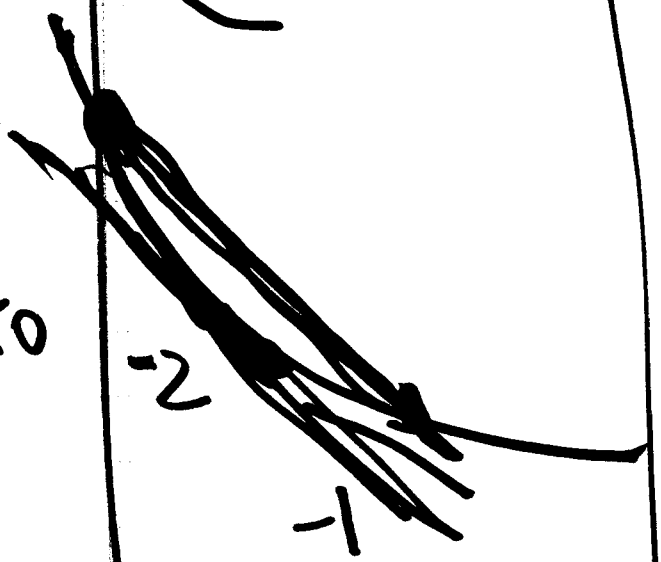
f' decreases



Inc/Dec to the right

as x increases

$f' < 0$



Concave up
f' inc
$f'' > 0$

Concave down
$f' < 0$
$f'' < 0$

$$f(x) = \sqrt{3x^2+4x+7} = (3x^2+4x+7)^{\frac{1}{2}}$$

$$= (u(x))^{\frac{1}{2}} \qquad v(u(x))$$

$$v(x) = x^{\frac{1}{2}}$$

$$f'(x) = \frac{1}{2}(u(x))^{-\frac{1}{2}} \cdot u'(x)$$

$$v'(u(x)) \cdot u'(x)$$

$$f'(x) = \frac{1}{2}(3x^2+4x+7)^{-\frac{1}{2}} \cdot [illegible]x+4$$

$$f(x) = w(v(u(x)))$$

$$f'(x) = w'(v(u(x))) \cdot v'(u(x)) \cdot u'(x)$$

$$w = 3z \quad z = 5y \quad y = 7x$$

$$w = 3(5(7 \cdot x))$$

$$= (3 \cdot 5 \cdot 7)\, x$$

$$\frac{dw}{dx} = \frac{dw}{dz}\Big|_{z(y(x))} \frac{dz}{dy}\Big|_{y(x)} \frac{dy}{dx}$$

$$f(x) = \sqrt[3]{(5\sqrt{x}+3)^2}$$

$$= \left[(5x^{\frac{1}{2}}+3)^2\right]^{\frac{1}{3}}$$

$$f'(x) = \frac{1}{3}\left[(5x^{\frac{1}{2}}+3)^2\right]^{-\frac{2}{3}} \cdot 2\cdot(5x^{\frac{1}{2}}+3)\cdot\frac{5}{2}x^{-\frac{1}{2}}$$

$\frac{1}{3}-1=-\frac{2}{3}$

$$f(x) = e^x \quad f'(x) = 1e^x$$

$$f(x) = e^{(x^2)} \quad f'(x) = e^{x^2}\cdot 2x$$

$$\frac{d}{du}e^u = e^u$$

$$\frac{d}{dx}e^{u(x)} = e^{u(x)}\cdot\frac{du}{dx}$$

$f(x) = (x^3+1)^7$

$f'(x) =$ ~~$(3x^2)$~~ $7(x^3+1)^6 \cdot 3x^2$

$f(x) = e^{x^3}$

$f'(x) = e^{x^3} \cdot 3x^2$

$f(x) = \sin x \quad f'(x) = \cos x$

$f(x) = \sin(x^2) \quad f'(x) = \cos(x^2) \cdot 2x$

$f(x) = e^{\sin(x)} \quad f'(x) = e^{\sin x} \cdot \cos x$

$$f(x) = \underbrace{x^{\frac{1}{3}}}_{u}\ \underbrace{(2x+8)^{\frac{1}{2}}}_{v}$$

$$f'(x) = \frac{1}{3}x^{-2/3}(2x+8)^{\frac{1}{2}} + x^{\frac{1}{3}} \cdot \frac{1}{2}(2x+8)^{-\frac{1}{2}}(2)$$

$$u' \quad v \quad + \quad u \quad v'$$