2003 AP Calculus Exam: Section A

5. $\int_0^{\pi/4} \sin x\,dx$

$\cos\theta = \frac{x}{r}$

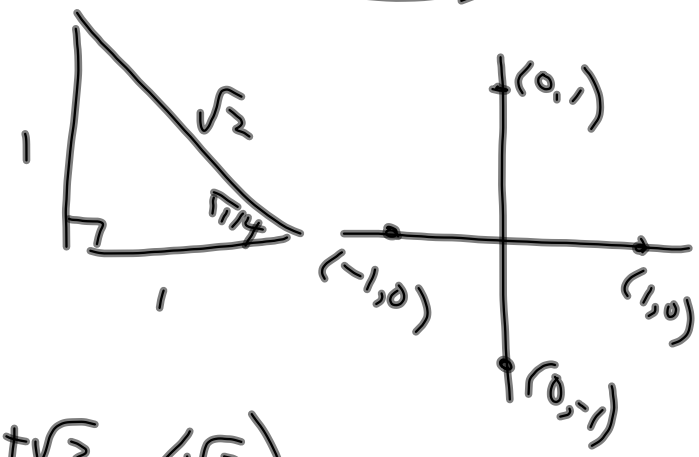
$= -\cos x \Big|_0^{\pi/4}$

$= -\left(\frac{\sqrt{2}}{2} - 1\right)$

$= -\frac{1}{\sqrt{2}} + \frac{\sqrt{2}}{\sqrt{2}} = \frac{-1+\sqrt{2}}{\sqrt{2}}\left(\frac{\sqrt{2}}{\sqrt{2}}\right)$

$= \frac{-\sqrt{2}+2}{2}$

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



19. $\int \frac{dy}{dx} = \int 2x+3 \qquad (1,2)$

$y = x^2 + 3x + C$

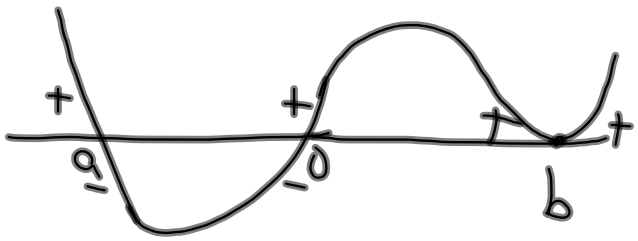
$2 = 1 + 3 + C$

$-2 = C$

$y = x^2 + 3x - 2$

21. $f''(x) = x(x-a)(x-b)^2$

Point(s) of inflection → Possible $x = 0, a, b$



23. $\frac{d}{dx}\int_0^{x^2} \sin(t^3)\,dt$

$= \sin(x^2)^3 \,(2x)$ ← $\frac{db}{}$

$= 2x\sin x^6$

24. $f'(x) = 12x^2 - 5$

at $x = -1$

$f'(-1) = 12(-1)^2 - 5$

$= 7$

$f(-1) = -4 + 5 + 3$

$= 4$

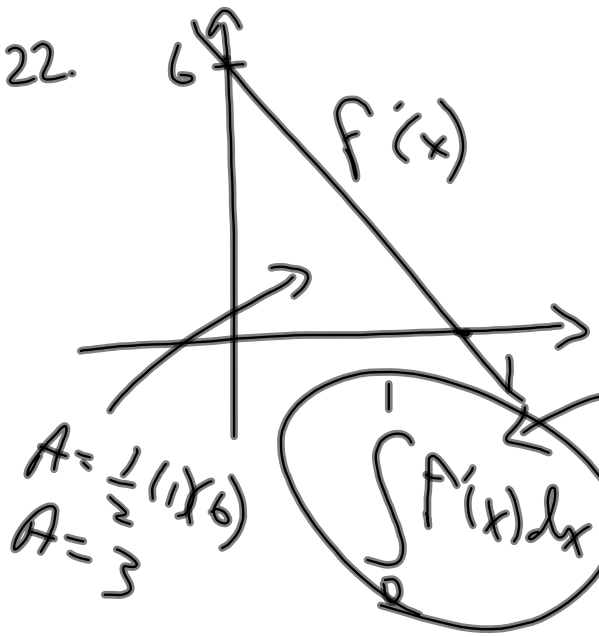
$(-1, 4)$

$y - 4 = 7(x + 1)$

$y - 4 = 7x + 7$

$y = 7x + 11$

22.



$f(0) = 5$

$f(1) = ?$

$A = \frac{1}{2}(1)(6)$

$A = 3$

$\int_0^1 f'(x)\,dx = f(1) - f(0)$

$3 = f(1) - 5$

$f(1) = 8$

27. $f(x) = x^3 + x$

$y = x^3 + x$

$x = y^3 + y$

$1 = 3y^2 \frac{dy}{dx} + \frac{dy}{dx}$

$\frac{dy}{dx} = \frac{1}{3y^2+1}$

$\frac{dy}{dx} = \frac{1}{3(1)^2+1} = \frac{1}{4}$

$g(x) = f^{-1}(x)$ ← Inverse

$x=2$ $\quad g(2) = 1$ $\quad y=1$

$g'(2) = ?$

$x=2$

28. $g'(x) > 0$, for all $x \in R$

$\rightarrow g(x)$ always Inc

$g''(x) > 0$, always Concave Up